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Conveyors Add to Working Radius

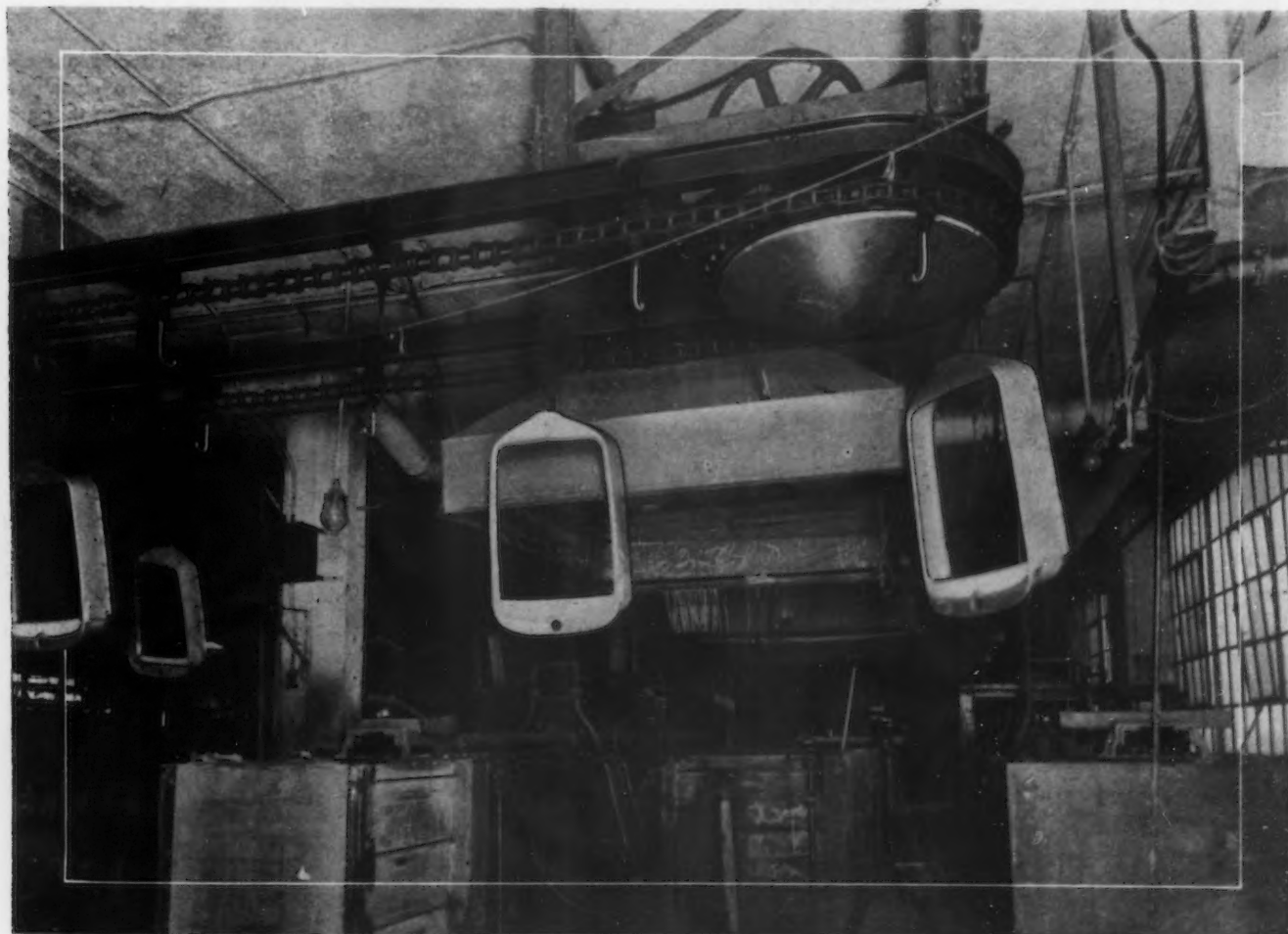
Equipment Makes Feasible the Dispersion of
Departments, When Space Near-by
Is Not Available

BY FRED L. PRENTISS*

RECENT installations of conveying equipment in the plant of the Willys-Overland Co., Toledo, Ohio, include a complete system of overhead conveyors for handling automobile radiator shells through the rad-

iator plating department, and gravity and overhead conveyors in the radiator core assembly and testing departments. The use of conveyors eliminates the storage of radiator shells and cores on the floor. Both parts are kept in motion on the conveyors practically all the time up to final assembly, except when they are removed for op-

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THREE Overhead Conveyors, All with One Drive, Carry the Radiator Shells Over Four Lines of Polishing Machines, on Which They Are Prepared for Chromium Plating. Each conveyor loops back in the opposite direction, making in all six parallel lines of overhead conveyors in the shell polishing department

erations. They are returned to the conveyor when each operation is finished.

The shell after plating, and the core after assembly, are carried a considerable distance on overhead conveyors. They meet at a point where the shells and cores are assembled together to make a complete radiator. The shell-plating and core-assembly departments and their conveying lines have a capacity of over 2000 radiators a day.

Production has been materially increased by the use of the conveyors. Considerable floor space has been saved by the efficient handling of these parts in process, and by the entire avoidance of storage of the shells and cores on the floor.

Various material-handling and production problems

There they are within easy reach of the men working on the third line of machines. These also return the pieces to the conveyor, on which they are carried around the third loop to the fourth line of machines.

Leaving the polishing department, the shells move on the last conveyor line to the copper and nickel-plating department, which has automatic plating equipment. Two separate overhead conveyor systems serve respectively the copper and the nickel-plating units. After cleaning, the shells are suspended on a conveyor in the copper-plating tank, in which they make one revolution. Then they are rinsed in water, after which they are hung on the first overhead carrier, which carries them to the copper buffers.

Leaving the buffing machines they are put back on the same conveyor, which takes them to cleaning tanks and



BACK Seat Assembly Line. The truck and assembly fixture are shown on the curve. The conveyor is of the chain-on-edge type, with caterpillar drive. In the picture the drawbar hook is detached from the chain, to show the simplicity of parts

growing out of increases in plant capacity necessitate rearrangement. Production of certain parts at a long distance from sub or final assembly lines has been permitted by the installation of conveyors for bringing parts from other buildings to the assembly line.

From One Operation to the Next on Chain Conveyor

RADIATOR shells, brought from the press room on trucks, are hung on a conveyor in the grinding and polishing department. There are four lines of machines, arranged back to back in two double rows, with an aisle in the center. On the first line of machines the shells are rough polished. On the succeeding lines they are given a finer surface, finish polishing being done on the fourth or last row of machines.

Three loops of overhead conveyors, all operated by one drive, serve the polishing machines. A machine operator on the first line lifts a shell from the conveyor above his head, polishes it and hangs it back on the conveyor, on which it moves around the loop and back over the second row of machines for the second polishing operation. Operators on this line hang the shells, after the second polishing, on the center conveyor directly back of them, and the shells move around the center loop to the opposite side.

then to the nickel-plating tank. After nickel plating the second overhead conveyor carries them to the nickel buffers. Leaving the buffers they are suspended on another conveyor, which carries them to the chromium-plating department, on the opposite side of the room.

After chromium plating and rinsing, the shells are hung on another conveyor, which takes them to buffing machines for finish polishing. After brackets are assembled to the shells they go back to the conveyor, which carries them to a spray booth, where one section of the shell is lacquered. Then a conveyor 325 ft. long carries them to the radiator assembly department. While moving along this line the shells are taken from the conveyors to benches beneath, where the name plates and stay-bar brackets are affixed. Then they are hung back on the conveyor.

Reaching the radiator assembly department, the shells are removed from the conveyor, cores are put in and the finished radiators are loaded on trailers to go to the chassis assembly department. In moving through the plating and on to the radiator assembly department the shells are suspended on conveyor hooks on 30-in. centers. Two of the conveyors in the polishing department are 220 ft. long and the third 210 ft. long. The length of the conveyor in the copper-plating department is 140 ft. and in the nickel-plating department, 110 ft. From the nickel



PRODUCTION Has Been Increased and Floor Space Materially Reduced in the Radiator Core Assembly Department by the Use of Roller Conveyors. Assemblers take the cores from the upper deck of the roller conveyors shown in the picture and after their operations push the cores back on to the lower deck of this conveyor

buffing machines to the chrome-plating department the conveyor carries the shells 440 ft.

Using Double-Deck Roller Conveyor

IN the core-assembly department the radiator core is clamped in a metal form on a stationary table and set on a sheet-metal carrier. This is pushed on to an air lift, which raises it to the upper table of a double-deck roller conveyor, with work benches located alongside. Workmen

take the cores from the roller table, straighten them out on the benches and push them back on to the lower roller conveyor, on the same plane as their benches. The roller conveyor loops around the end of the room, where the core is given an acid dip in a tank and then soldered.

After soldering, the core is placed on another roller conveyor line. While on this table the carrier and binding plates are removed and shoved on to a roller section mounted on an air hoist, which lifts them up to the level



DIFFERENTIALS Are Assembled on a Roller-Type Conveyor Oval in Form. The differential case is handled on the conveyor on a carrier having a rotating carriage

of the table where they started their circuit. The core is carried a few feet to another roller conveyor, on which it moves to a point where the outside rows are trimmed, final soldering is done and the core is inspected. It is then carried on a truck to another room, where tanks and other parts are assembled.

In this department are several transverse roller conveyors for handling the cores to the testing tanks, where they are tested under 10-lb. air pressure. Here they are hung on an overhead conveyor and, while moving on this, water is blown out of the cores, and steam is forced inside to dry the outside of the cores and clean out the acid. Then they are spray painted and placed on trucks to dry. The next and final operation is testing in tanks of water. Thence they are hung on another conveyor, which carries them to the assembly department, where they meet the shells. Cores reaching the assembly department faster than they are needed remain on the conveyor and make another circuit.

Assembly Seat Backs on a Conveyor

AN unique application of a conveyor for progressive assembling is found in the use of a conveyor for assembling seat backs. This is a chain-type conveyor, oval in form, 177 ft. long, and operating just above the floor. An interesting feature is that this conveyor chain runs on its edges. The seat back is assembled on a wooden fixture mounted on a truck, having especially designed casters that move on a track with a flanged rail on one side.

To prevent the fixture from tipping sideways during assembling, the truck has angle iron grids on both sides of the caster brackets. For convenience in assembling, the fixture may be turned 90 deg. from perpendicular in either direction. Starting with the metal frame that forms the seat back, the springs, padding and upholstery are assembled. This work is done entirely by girls, at the 24 working stations around the conveyor. Moving at a maximum speed of 5 ft. a minute, the conveyor has a capacity of 300 seat back assemblies a day.

An advantage found in this method of progressive seat back assembling is that the operations are so divided that each girl can quickly learn to become adept at her part of the work, on which she is employed on a piece-rate basis. Before the adoption of progressive assembling on a con-

veyor the work was not split up as at present. A disadvantage of the old assembly method, which has been eliminated by the new conveyor line, is that, when a sharp speeding up in production took place, as frequently happens in an automobile plant, it took some time to train girls to do all the various operations required in assembling a seat back.

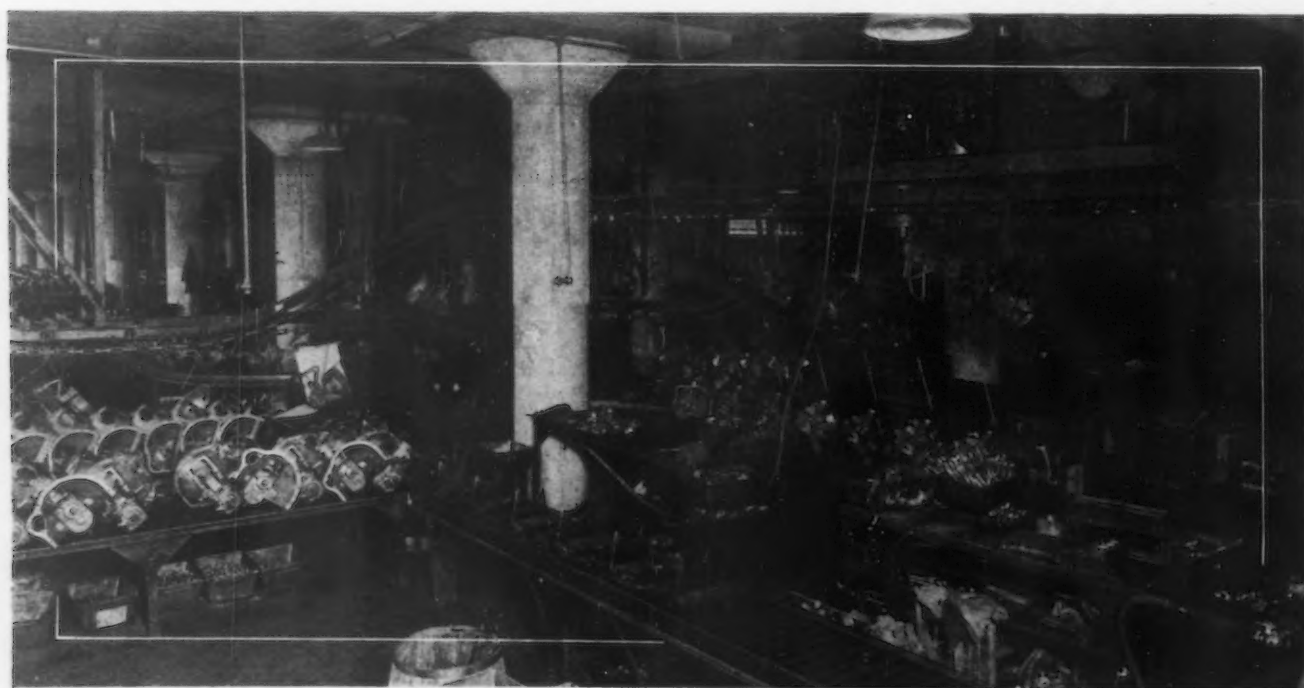
Seat backs would naturally be assembled at the side of the body-assembly line, but space was not available in that part of the plant. However, by providing a suitable carrying conveyor the company was able to place this department at a considerable distance from the body-assembly department. An overhead conveyor 2340 ft. long, recently installed for this purpose, passes through three buildings and over two different floor levels. The seat backs are hung on conveyor hooks on 8-ft. centers and the conveyor moves at a speed of 40 ft. a minute. There are two unloading points, at which the conveyor dips down to about 4 ft. from the floor, for convenience in removing the seat backs, which are placed on storage racks and trucked, as needed, a short distance to the body-assembly lines.

Motors Put Together on Roller Conveyor

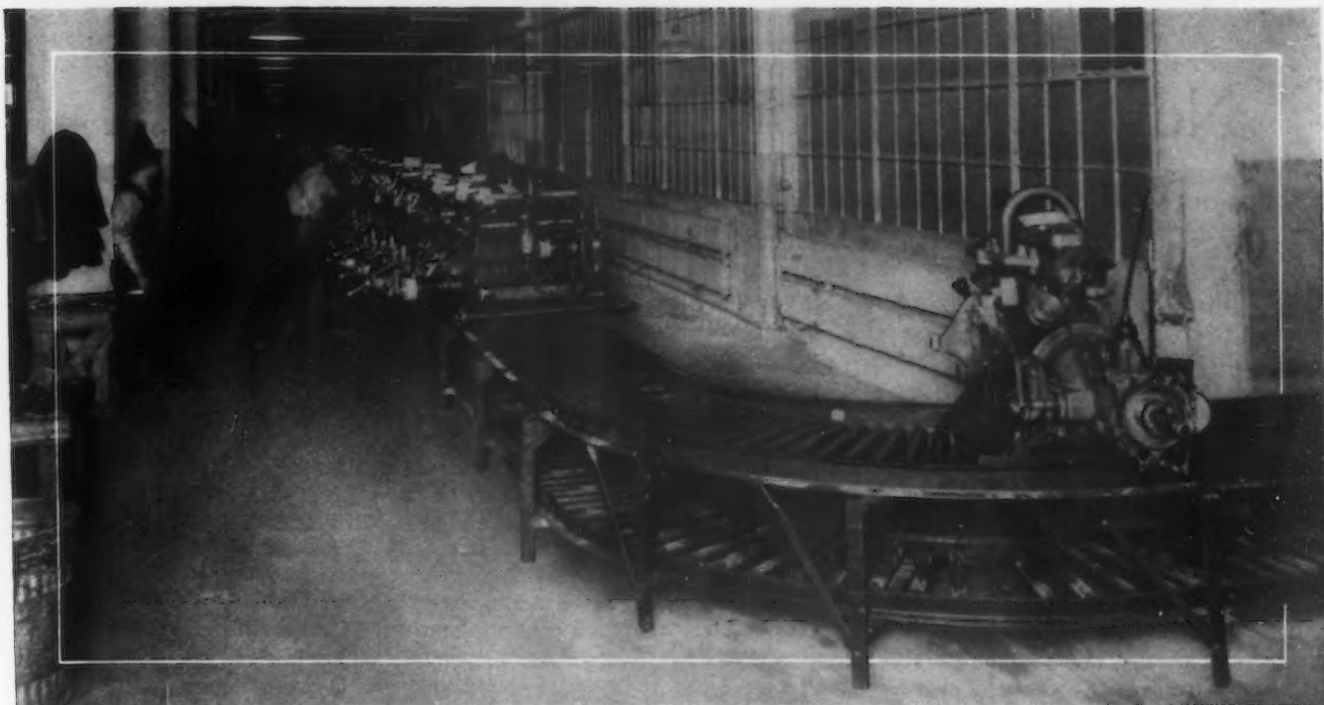
FINAL assembling of Willys-Knight motors is done on a gravity roller conveyor on which the motors move toward the point where they are installed in the chasses. While on this conveyor the starter, motor transmission assembly, clutch and spark plugs are assembled to the motor. The fan belt is put on, oil and grease are put in and the motor is given its final inspection. The motor moves on the conveyor on a structural steel carrier on which the flanges of the oil case rest. This conveyor is 200 ft. long, 130 ft. being used for assembling purposes and 70 ft. for storage.

Differentials are assembled on a roller-type oval conveyor 75 ft. long, having 28 ft. of straight track on each side. The most important operation on this line is placing the gears in the differential case. The case is mounted on a heavy cast iron fixture or carrier which has a rotating carriage. The carrier slides under steel angles at each side or at the end of the rollers, the angles preventing it from tipping.

Transmissions are assembled on a roller conveyor circular in form, on which the hand-brake levers, shifting



TRANSMISSIONS Assembled on a Roller Conveyor Are Transferred to the Overhead Conveyor Shown, on Which They Are Taken 1980 Ft. to the Motor-Assembly Line



WILLYS-KNIGHT Motors Are Assembled on a Gravity Roller Conveyor, on Which They Move During Progressive Assembling to a Point Near Which They Are Installed in the Chassis

levers, clutch and brake pedals and steering posts are assembled. An overhead conveyor delivers the transmissions to the roller table and from this, after assembly, they are suspended on hooks on 4-ft. centers on a conveyor 1980 ft. long, which carries them through two buildings to the motor-assembly line. This conveyor line, which was put in because there was no room to assemble transmissions near the motor-assembly lines, eliminates trucking from stock.

Bodies Polished While in Motion

After lacquering, the outsides of the bodies are polished as they move along on a conveyor, thus saving a large amount of trucking. The work is done with electrically operated polishing machines having felt wheels driven through flexible shafts. There are 24 of these machines, 12 on the outer side of each of the two parallel conveyor lines at this point. Each machine is suspended from a trolley which may be moved backward and forward 10 ft. in either direction. This permits the polisher to move the machine along with the movement of the body he is polishing. The bodies after polishing stay on

these conveyor lines, moving along to points where they are touched up, striped and inspected, all of which is done while they are in motion.

Export Parts Handled Differently

All unpainted metal parts for export go to the first floor of the export department, where large parts are hung on hooks on a conveyor and small parts are placed in baskets. While on this conveyor they are dipped in heavy oil, to prevent rusting, in a tank 30 ft. long. Leaving the tank, the conveyor carries them over a drain and up to the third floor for packing.

Overhead conveyors in the radiator shell plating and core-making departments were installed by Mechanical Handling Systems, Inc., and Jarvis B. Webb Co., both of Detroit. The former company supplied the conveyors used for assembling the seat backs and for handling transmissions, and the floor conveyors for handling bodies on trucks. The Logan Co., Louisville, Ky., furnished the roller conveyors in the radiator core assembly department, and those used in assembling differentials and Willys-Knight motors.

Conditions in Upper Section of Blast Furnaces Studied

A SURPRISINGLY large portion of the iron blast furnace shaft is devoted to preparations of the charge for final reactions that take place in the lower portion or crucible of the furnace. Efficiency of operation depends to a great extent upon the conditions in the upper portion of the furnace. A survey of these conditions in the upper section of seven industrial furnaces has been made by the North Central Experiment Station of the United States Bureau of Mines, Department of Commerce, in cooperation with the University of Minnesota, Minneapolis. Furnaces operating on Lake ores, on Southern ores and on Western ores were tested.

The velocity, temperature and composition of the gas

varied from the edge to the center of the furnace, indicating that the ideal case of true counter-current movement of gas and solids is not closely approached. It is concluded, as a result of these investigations, that sintering the finer sizes of Mesabi ores, and crushing and sizing of hard, coarser ores, such as those used in the South and West, would increase daily output, lower fuel consumption and dust losses, and decrease overhead charges. Investigations made by the Bureau of Mines in the laboratory and in the field show that an ideal iron ore from the standpoint of physical structure is one that contains a large proportion of intermediate sizes between 20-mesh and 2-in. pieces.



New Pipe-Making Methods Outlined

Fusion Welded Pipe Requires Small Percentage of Heat Necessary for Butt or Lap Welding—Various Principles Utilized and Development Is Rapid

BY ROBERT E. KINKEAD*

STEEL pipe manufacturers are beginning to believe that they are not exempt from the troubles encountered by other industries which have been upset by new engineering ideas. As in the case of the ice manufacturers, who have had to compete with domestic refrigeration, pipe manufacturers are faced with competition from the new methods of welding which threaten to make obsolete millions of dollars' worth of existing equipment.

The matter was brought forcibly to their attention by an outsider who was supposed to be merely a manufacturer of automobile frames and rear axle housings. He received a great deal of astonished attention when he went

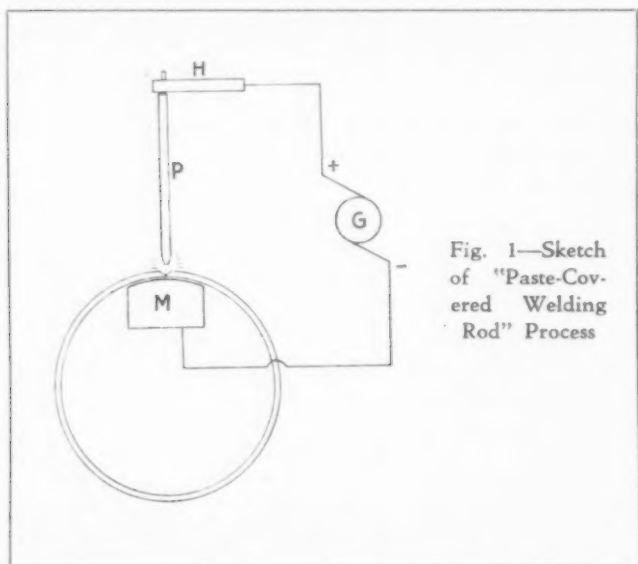


Fig. 1—Sketch of "Paste-Covered Welding Rod" Process

out and took large tonnages of steel pipe away from the recognized pipe makers with his new pipe-making method. The chorus has now died down to the well modulated tones of directors authorizing heavy expenditures for experimental work to find out what it is all about.

Making pipe or tube of any size or specification is largely a matter of heat cost and mechanical working cost. It may be true that heat cost and mechanical working cost are locked together in an inseparable manner, but, since amateur pipe-making ideas have been the cause of all the trouble, it might be well to try to separate the two for the moment in order to find out something about the implications of the new pipe-making methods.

Comparative Heat Requirements

If a 12-in. diameter pipe 20 ft. long is to be made by the old established lap welding or butt welding processes, using 20-lb. plate, roughly 1200 lb. of steel will have to be heated to the welding temperature. We may, for our purposes, neglect reheating during the welding and sizing operations. On the other hand, if the same pipe is to be made by one of the electric or gas welding processes, con-

siderably less than one inch of metal on either side of the seam to be welded will have to be heated to the welding temperature. For rough estimating purposes, we may say that the new processes heat two inches of the periphery of the pipe, instead of the whole periphery. The ratio of heat required for 12-in. pipe in the two methods being compared is of the order of 2 in. to 36 in., or 1 to 18. So long as 18 lb. of coal costs more than 1 lb. of coal, this element of cost in pipe making will probably have considerable significance, even after all the conversion losses between coal pile and welded seam are allowed for.

A brief statement summarizing the argument is that the thermal advantage of the newer welding processes lies in the fact that the weld may be made in pipe without the necessity of heating the whole pipe to a welding temperature.

Cold Forming Versus Hot Bending

But we have put the cart before the horse, so to speak, in neglecting to consider the matter of getting the plate or skelp into a cylindrical form preparatory to welding. That is an energy expenditure, and figures back to the coal pile. The gentleman who could press automobile frames cold naturally assumed that he could press pipe the same way. It cost a lot of money for bending equipment, but after the figures were all in, he probably found that it did not require a great deal more power to cold press the pipe in his plant than it did to pull the hot pipe through the dies and rolls in the old process.

Leaving out further details of the adventure (and it must be admitted that both pros and cons are left out), the above is an outline of the reasons for the wide interest among manufacturers in the new welding processes for making pipe. We may now pass to the consumer's view of the matter.

It was found that the buyers of pipe did not care how the pipe was made, so long as it was reasonably round

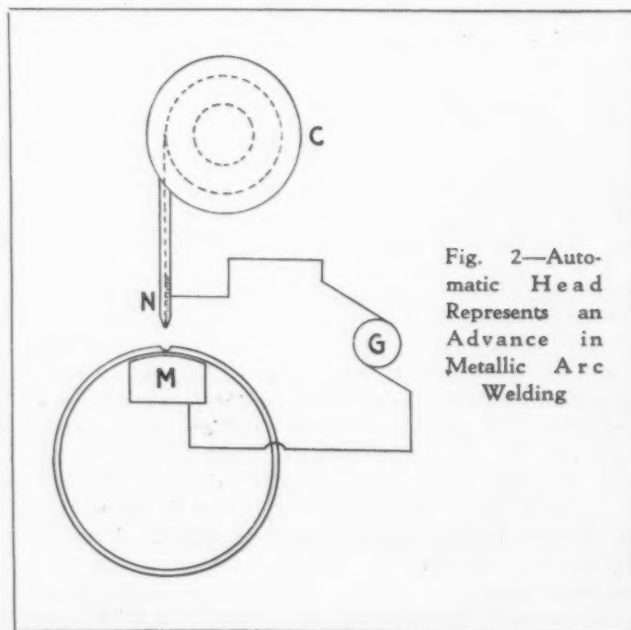
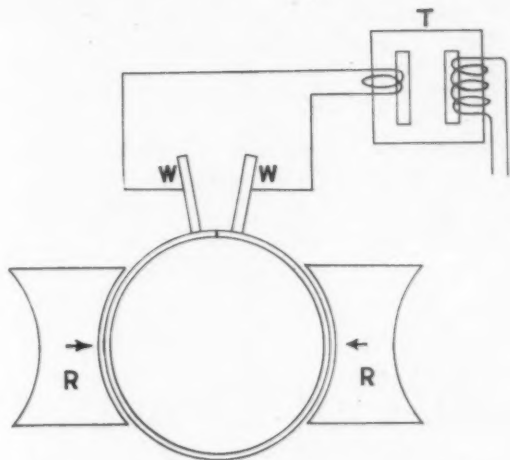
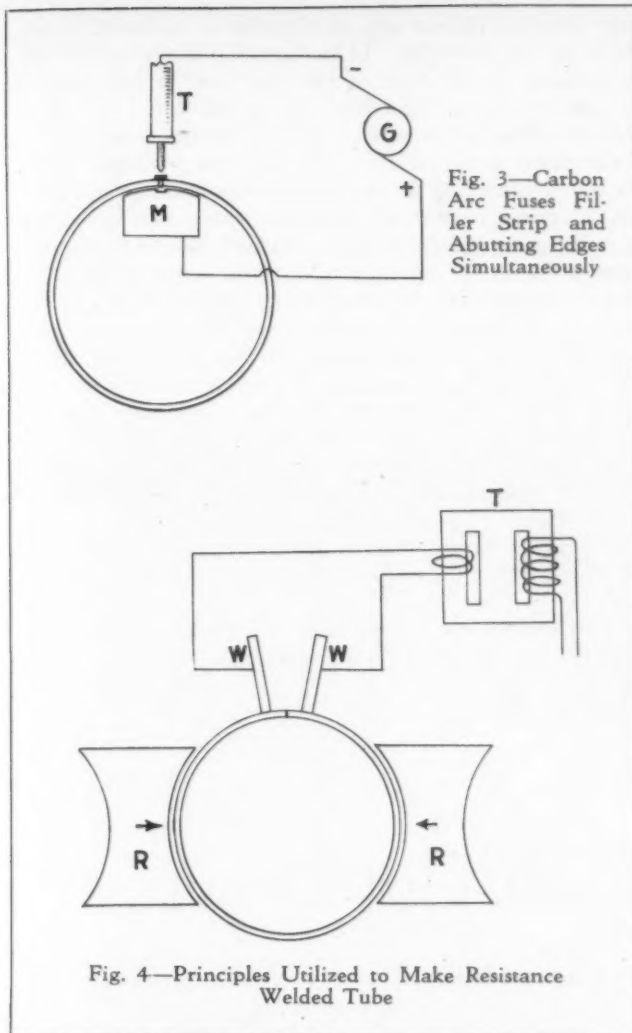


Fig. 2—Automatic Head Represents an Advance in Metallic Arc Welding

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and it would, under test, burst anywhere but in the weld. If a new process would mean a saving of \$50,000 to \$100,000 on a long pipe line, the process by which the pipe was made would look good enough to almost any buyer of pipe.

The welding processes by which the longitudinal seam in pipe is welded without heating all of the metal are very simple in principle. Fundamentally, they all revolve around the proposition of producing a large amount of heat within a very restricted area. The electric arc and the oxy-acetylene flame naturally occur to one as being sources of such localized heat of great intensity. However, the resistance welding process is also one of the most important methods used in the welding of tubes and at present holds promise of great usefulness for welding larger pipe.

The accompanying sketches show in a general way how the heat is applied locally in the vicinity of the seam to be welded by the newer processes. No attempt will be made to do more than discuss the general principle of heat application. It should be mentioned that all these methods of welding are covered by many patents.

Covered Electrodes Used by Pioneering Pipe Maker

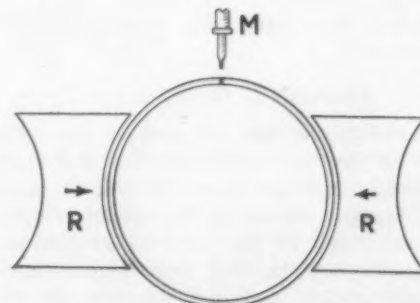
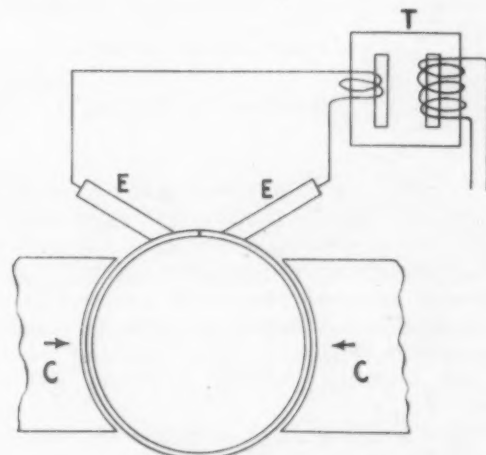
Fig. 1 shows the general arrangement for welding pipe by the "paste-covered welding rod" process (the process used at the outset and which made it necessary for the industry to reconsider the established methods of welding pipe). The electrode P is connected to the positive side of a generator and held in a holder H, which may be manually lowered to compensate for the consumption of the electrode, or may be moved by an electrically operated feeding mechanism. The paste covering on the welding rod protects the metal being placed in the joint from the

action of the atmosphere during the welding operation and assures ductile metal in the weld. The mandrel M confines the metal being added to the seam and prevents its running through to the inside of the pipe. The edges of the pipe are originally scarfed to give an opening approximately semi-circular in cross section. One or more trips across the pipe seam are made to put the required amount of filler material in the seam.

The arc welding process illustrated in Fig. 2 feeds the metal electrode through an automatic head, the nozzle of which is shown at N. The automatic head maintains the proper length of arc and feeds the electrode from the coil C as it is required. One such automatic head may make several trips along the seam to supply sufficient metal to fill up the kerf between the edges to be joined, or several heads may be operated in sequence so the complete weld is made at one trip of the whole mechanism lengthwise of the pipe.

Fig. 3 shows the general plan of operation of the machine-driven carbon arc process. In this process the filler material is laid on the seam in the form of a strip or rod and the carbon arc is used to fuse the edges and the strip into a homogeneous mass. The mandrel M stops the molten metal at the inner surface of the pipe. A gas envelope is furnished by burning a paper twine against the hot carbon of the electrode, and in this manner ductile metal in the weld is obtained. The carbon arc is stabilized by a strong magnetic field produced at T which is concentric with the vertical axis of the carbon electrode.

The general plan of the resistance welding process now used in the manufacture of welded thin-walled steel tubing is shown in Fig. 4. This is a continuous process in which



the curled strip is passed through rolls *R-R*, which squeezes the edges together. Rolls *W-W* are connected to the low-voltage side of a transformer *T*, the current passing from *W* to *W* through the seam, thereby producing heat which, in combination with the squeezing action of the rolls *R-R*, produces a weld. The weld made by this process is quite ductile.

Fig. 5 shows a proposed application of the flash welding process. Clamps *C-C* force the edges of the seam together while heavy welding currents are supplied through the brushes *E-E*.

Fig. 6 shows the general plan of making tubes or pipe with the oxy-acetylene flame. Pressure is applied to the pipe by the rolls *R-R* and heat applied at the seam by the torch *M*. While the sketch shows only one torch, it is common to use from three to six tips, one close behind another, for a high speed operation.*

Heat Generated in the Metal

It will be seen from the above notes on the new welding processes that they are all designed to produce the heat only at the point at which it is required to make the weld. In resistance welding all of the heat is produced within the metal to be welded. In the carbon arc process

*Details of the method and machinery used were described by J. L. Anderson in *THE IRON AGE*, Feb. 28.

approximately 60 per cent of the heat is produced within the metal to be welded. In the metallic arc processes approximately 85 per cent of the total heat is produced in the pipe and in the filler rod. All of the heat of the oxy-acetylene flame is produced externally to the metal.

Research men and engineers who are traveling about the country, looking at the various pipe welding methods, see, of course, only those processes which were developed in years gone by. The engineers and development men connected with the welding industry have filed large numbers of patent applications covering improvements in the electric arc, resistance and gas welding processes, and these developments will appear in the normal course of events as working processes within 18 months to two years. Some manufacturers are now being penalized for neglect to study the implications of the new welding processes, in the inability to catch up with developments in this direction, or even find out in what direction new discoveries will be made. In all probability much money will be wasted developing processes which either are covered by patent application, or which have been found to be impractical.

The bright spot in the situation from the pipe-makers' point of view is that reduced costs will undoubtedly widen the use of pipe, and a much larger tonnage will be required than has been made by the industry heretofore.

Time of Graphitization Cut Down

Malleable Iron Annealed in New Electric Furnace in Three-Day Cycle—Controlled Analysis and Observance of Laws Governing Graphitizing Are Essential

BY H. O. BREAKER*

THAT there is a well-defined market for what is known in the trade as malleable cast iron is generally recognized. However, most producers, as well as most users, also realize that the potential market can be greatly increased when it is commercially practical to produce this material by methods comparable with those used in the steel industry, effecting consistent, uniform and arbitrary physical properties and characteristics.

While there is still much to be desired in melting control and molding practice in the production of malleable iron, the graphitizing equipment and practice offer the greatest opportunity for improvement. Only too frequently malleable castings of satisfactory composition, properly molded, have proved to be unsatisfactory to the user because of improper graphitization. In fact, proper graphitizing will, to a surprising extent, discount errors in melting control.

Research in Graphitizing

Exact knowledge of the relation of the analysis of "white iron" to the physical properties and characteristics of malleable iron has been limited, at least in its application. Equally serious is the lack of comprehensive and exact knowledge of the laws of graphitization, as influenced by composition, time and temperature, peculiarities of heat cycles, and gas balances, in producing malleable iron of desired physical characteristics.

Several months ago the Industrial Furnace Corporation, Buffalo, undertook, with the cooperation of a re-

search organization (recently incorporated as the Hayes Malleable Iron Co., Chicago), to accomplish the following:

- 1.—To develop commercial graphitizing equipment and a process capable of producing, consistently, uniform malleable castings of predeterminable physical properties and characteristics.
2. To make such a product at less than present average production costs.
- 3.—To effect a material reduction of the time "in process" normally required in producing malleable iron.

The measure of success that eventually attended these efforts will be apparent from the results which are now possible of consistent duplication by any producer of malleable iron. There must be available, however, the proper equipment and the necessary metallurgical knowledge of the commercial application of the laws of graphitization.

More than five years of intensive academic research work by Dr. Anson Hayes and his associates developed the fundamental information which made possible the practical commercial heat cycles necessary in the graphitization of large tonnage loads of white iron castings.

Electric Elevator Type of Annealing Furnace

To obtain the desired results a special design of the elevator-type electric annealing furnace is used. (Patents and patent applications controlled by the Industrial Furnace Corporation.) The first commercial unit, of 15 tons net capacity, has now been in continuous operation for a year at the plant of the Acme Steel & Malleable Iron Works, Inc., Buffalo. During this time test heats of

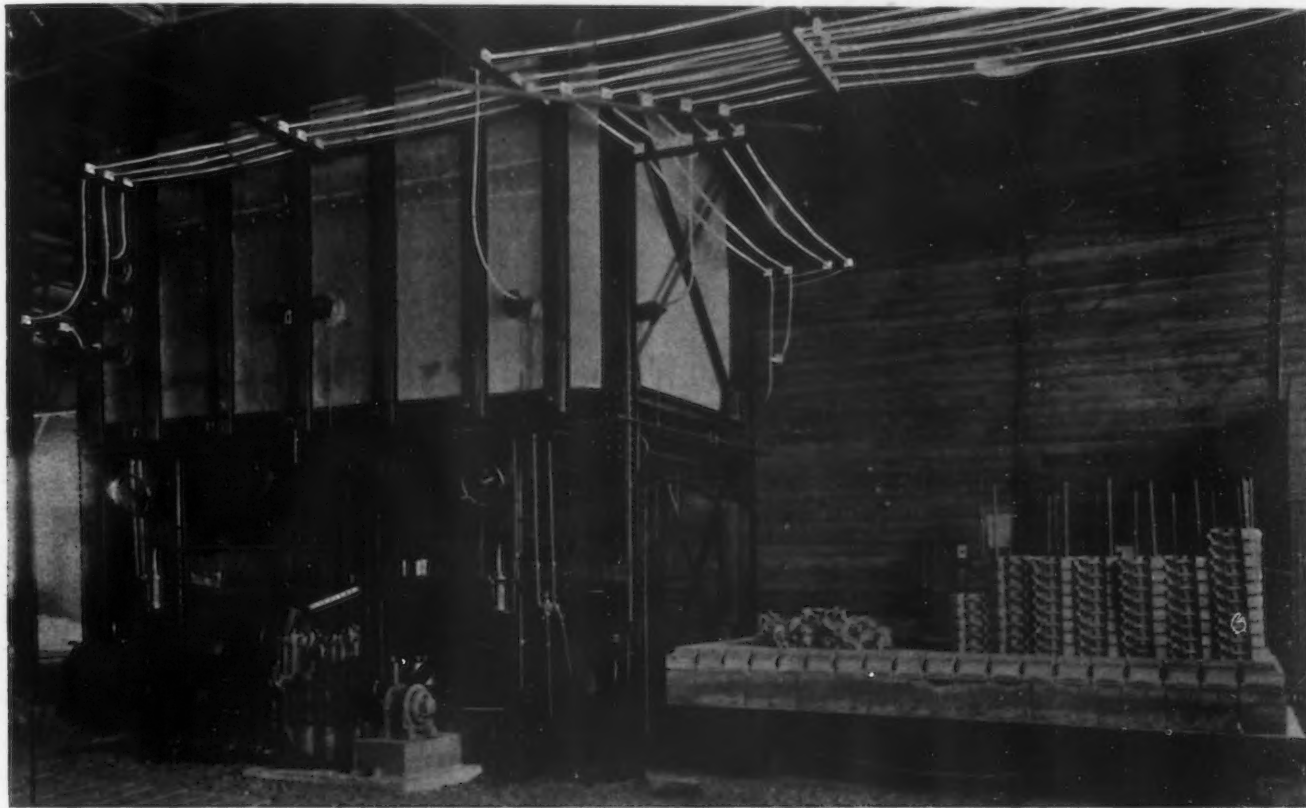
*President, Industrial Furnace Corporation, Buffalo.

practically all compositions of white iron, ranging from high-carbon cupola iron to air furnace iron of less than 2 per cent carbon, have been properly graphitized in short heat cycles and on a commercial basis. Equipment has now been developed, together with the operating technique, to make possible the handling of charges of 25 to 30 net tons, with an output of about 3000 tons per unit per year.

Results Already Obtained

The results of this development work may be briefly summarized as follows:

1. Establishing the necessary technique for producing arbitrarily, uniformly and consistently:
 - (a)—Castings having a physical structure per-



Special Electric Graphitization Furnace for Reducing the Time for Heat Treating Malleable Castings

mitting unusually high machining speeds, while still retaining physical properties indicated by 35,000 lb. yield point, 50,000 lb. per sq. in. ultimate and 15 per cent elongation:

(b)—Castings having normal physical properties, indicated by 40,000 lb. yield point, 60,000 lb. per sq. in. ultimate and 25 per cent elongation, with normal machinability:

(c)—Castings having abnormal physical properties indicated by 55,000 lb. yield point, 75,000 lb. per sq. in. ultimate and 5 per cent elongation, with only fair machinability:

(d)—Castings having a completely graphitized core, with a pearlitic wearing surface of very poor machinability.

2.—Developing commercial graphitizing equipment and formulated technique for accurate and complete graphitization of white iron in a total cycle of three days or less.

3.—Obtaining a material reduction in the total cost of producing malleable castings where the foundry has electrical energy available at normal average cost.

The importance of successful, commercial, short-cycle graphitization is quite apparent, not only in making possible better service to users, but in increasing the scope of the market. A rush order for castings was recently delivered four and one-half days after receipt

of patterns, not as a record test, but as a matter of service.

A By-Product of Right Analysis and Correct Laws

However, short cycles are really only a "by-product" of controlled analysis and the commercial application of the laws of graphitization. The possibility of producing consistently a much more uniform casting of desired physical properties and characteristics would appear to be of first importance. That this can be done more rapidly and at lower cost is merely an added gain.

The value of the development work referred to may be further indicated by stating that the translation of academic formulae for commercial application, and the

designing of satisfactory commercial graphitizing equipment, have been possible only through the actual experience gained from the graphitization of hundreds of tons of white iron of the widest range of chemical analyses and under practical foundry conditions.

The statements made in this brief summary are limited to an appraisal of results of research work that has been completed, and it is believed that further developments will be complementary rather than overlapping or conflicting.

Hadfield's cast manganese steel (12 per cent manganese) after heat treatment cannot be cut by the usual machine tools. A sufficiently hard tool may slightly "touch" the surface, but the layers just below automatically harden and resist the tool. Industrial uses have therefore been limited to shapes which can be cast with any subsequent finishing done by grinding. Drills have recently been made both in America and in England which can bore this material at commercial speed, and *Arts et Metiers* recounts a similar success in France. A tool of special high-speed analysis is hardened glass-hard, yet is tough enough to take the pressure of several tons necessary to penetrate cast high-manganese steel.

Tungsten-Carbide Cutting Tools

Precautions Necessary in Preparing Alloy and Mounting It on Holder—Rigidity Is Essential— Limitations to Use

BY HENRY J. LONG AND W. PAUL EDDY, JR.*

IT is not the purpose of this paper to discuss the general properties of tungsten-carbide tool materials; these have been adequately described by others in previous writings. It is, therefore, more in order at this time to present the results of experience in the fabrication of these tools and of both successful and unsuccessful attempts to apply them to various types of work, so as to assist in the readjustment of manufacturing practices which must necessarily take place, if we are to allocate to tungsten carbide its true place in industry.

Design and Fabrication of Tools

The brittleness of tungsten-carbide alloys is a property which encourages the use of a large, and especially a thick, tip in relation to the size of the cut to be taken. The factors limiting the tip size may be the cost of the material, the necessity for ample support of the cutting tip by a stronger and tougher material, and the space available for the operation of the whole tool. It is also necessary, in designing a tool, to consider chip space, especially in the case of a multiple-edged tool, so that there be no liability of chips becoming packed on the tool face to the extent that chipping of the edge results.

The comparative weakness of this material demands as sharp a cutting angle as possible, to reduce the chip pressure. If we are to use a large rake angle, however, without crumbling at the edge, absolute rigidity is essential.

As more rugged machines are built, and as fluctuations of power application are lessened, it will become possible to use steeper cutting angles. The angles are not the same, of course, for all jobs, but depend upon character of material being cut, type of tool used, speed, feed and condition of machine. As an example, we are using on lathe tools for malleable cast iron a front rake of 5 deg. and a side rake of 5 deg. We have hopes of increasing these angles for steel as we approach freedom from vibration in operation.

Inasmuch as heat generated in the tool is relatively unimportant, we find it possible to use broader-nosed tools of tungsten carbide than of high-speed steel, thus distributing the cut over wider areas and lengthening the life of the tools.

Partly in the interests of economy, the company with which the writers are associated is studying methods and technique of making tools tipped with tungsten-carbide alloy. This is, perhaps, a field in itself; yet it is one with which we believe every user of these tools should be familiar. With money tied up in such expensive material, it is imperative that the investor be in position to use it as efficiently as possible and to eliminate losses resulting from delays in procuring, regrinding, repairing or remodeling tools.

*Chief experimental engineer and assistant metallurgist, respectively, Brown-Lipe-Chapin Co., Syracuse, N. Y. The paper was read at the Rochester meeting of the American Society of Mechanical Engineers.

As it is usually impossible to purchase a piece of tungsten-carbide alloy of nearly the size required in a tool, the first problem encountered is that of removing from a small bar or stick of the alloy a piece of the desired size and shape, with minimum effort and the least possible loss. In the first place, the bar of alloy should be purchased with its application in mind, so that two dimensions of the proposed tip will have been fulfilled. Then it would appear merely necessary to cut the length desired by means of a thin grinding wheel, of the special composition recommended for grinding tungsten-carbide alloy.

Bar Fractures Before Fully Cut

It is not so simple, however. We have never been able to cut completely through even a thin piece of this alloy with a grinding wheel; the piece always fractures before the job is finished. By feeding the disk carefully so as not to heat the alloy excessively, and by turning the piece so as to grind into two opposite sides or perhaps into all four sides, it may be possible to cut away two-thirds of the section before the piece cracks. The discouraging feature is that, even with these deep notches carefully ground, the fracture is no more likely to occur between the notches than anywhere else, with the limitation, of course, that it always starts in one of the notches.

We have found, after many trials, that to grind on one side only (one of the broader sides, if the section is not square) directly into the piece until it cracks is as sure as any method of resulting in a flat fracture in the desired plane. With this method the feed of the wheel into the work, within reasonable limits, appears to have little influence on the result. The fracture, by the way, with any method, usually does not begin at the lowest point of a notch, but rather at the side of its rounded bottom, on a line with one wall of the notch. The notching should not be attempted by hand, but should be done on a small surface grinder. We are using a 7-in. wheel, not less than $\frac{3}{8}$ in. thick, on the circumference of which has been dressed a rim approximately $\frac{1}{16}$ in. thick and $\frac{1}{4}$ in. wide, with fillets at the shoulders and with a rounded edge.

Mounting Requires a Firm Support

The next step is mounting the tips on the holders. Firm support is of paramount importance. The tip must fit the seat closely, and should have contact over not less than three sides. Blades of multiple-edged tools, such as reamers and facers, may be made of thin, flat pieces of alloy, which should be mounted in slots sawed at angles of 10 to 12 deg. to the direction of motion at the cutting points. This method results in locking the blades against the pressure of the chip, which would otherwise pull out the blades during operation.

Brazing may be done by heating the holder and tip in a furnace having an atmosphere of nitrogen or hydrogen, using copper as the brazing material. Good results can be obtained, however, without such a furnace, by heat-

ing in the flame of a blow-torch, provided a brass alloy be substituted for copper. The strength of a well brazed joint of brass may not be so great as that of an equally good copper joint. But, owing to the fact that the brass flows more freely, a complete filling of the joint can be made much more easily under the blow-torch with brass than with copper.

The tip or blade may be ground to its final shape after mounting. In the past we have occasionally encountered tips which by their crumbling defied all our efforts to grind a good edge. Various methods of impregnating several materials with fine abrasive for use as laps, as well as many ideas on lapping processes, were investigated to overcome this difficulty. We developed machine lapping with an aluminum disk on which was brushed a fine silicon-carbide paste. This served the purpose fairly well, although there were still some edges which required finishing with a hand lap of brass.

Of late, however, both grinding wheels and our technique seem to have improved. We find that a fixed position on a surface grinder results in a rounding or crumbling of the point; consequently we grind by hand, moving the tool across the side of the wheel.

Good results in roughing are obtained with a certain Czechoslovakian silicon-carbide wheel and with 60-I to 80-I Crystolon wheels. For finishing a 100-I Crystolon wheel is satisfactory. Wheel speeds are approximately 3400 r.p.m. We now rarely find it necessary to resort to lapping as the finishing operation. We feel, however, that further improvement is possible, possibly through the use of a still finer finishing wheel.

Cutting Malleable Cast Iron

As is well known, the properties of tungsten-carbide alloy point to the low-tensile materials as the field of greatest service. We have found a number of operations on malleable iron castings to which these tools are applicable.

One of these is the breaking down or chamfering of the flanges of differential case castings. The operation is the first performed on the rough casting. One typical case requires a chamfer of about $\frac{1}{4}$ in. on a flange of 9-in. diameter. Best previous results were obtained with Stellite, cutting at a speed of 72 r.p.m. and with a feed of 0.014 in.; the production per grind averaged 200 pieces. By simply replacing the tool with tungsten-carbide alloy, the average production jumped to over 7000 pieces per grind.

On the same lathe set-up, the flange is rough-faced. Stellite was formerly used, making a cut $\frac{1}{16}$ in. deep, with a feed of 0.014 in. at the same speed as above, 170 ft. a minute; the tool life was about 150 pieces per grind. Tungsten-carbide tools are averaging 700 pieces per grind. The speed of these operations are at present limited by other tools, notably a reamer, on the set-up.

Finish-facing of the same flange is then performed on another lathe. High-speed steel tools formerly used produced an average of 400 pieces per grind. Tungsten-carbide tools operating at a speed of 300 ft. a minute, with 0.013 in. feed, average 12,000 pieces a grind.

These tools do not give quite so smooth a finish on the work as did high-speed steel, but their big advantage, aside from increased production, is the elimination of size variation. It was necessary for the operator to readjust the set-up several times during the life of a steel tool. With the tungsten carbide no adjustment is required throughout a day's run, and no difference in size between the first and last piece can be detected.

Another malleable cast iron application is that of line-reaming pinion bores of differential carriers. A double reamer $3\frac{1}{2}$ in. in diameter, each section having six blades, is run on one such job, at 80 r.p.m., removing about 0.015 in. with a feed of 0.052 in. High-speed steel reamers pro-

duced an average of about 1500 pieces per grind, and each reamer had a total life of about 6000 pieces. The tungsten-carbide reamers average 9500 pieces per grind, and the life of a reamer is approximately 28,500 pieces.

In this application better finish as well as less size variation is obtained with tungsten carbide. The rate of production, furthermore, has been increased approximately 20 per cent, as the high-speed reamers were run at half the above speed, with a little greater feed.

In all the above applications we may say that, though improvements may still be expected, the use of tungsten-carbide tools has progressed beyond the experimental stage. These tools have been definitely adopted as standard on these jobs, simply because they have proved advantageous, either from an economic or from a quality-of-product standpoint.

Use on Gray Cast Iron

Certain pinion spacers are now made of malleable cast iron. To obtain greater crushing strength and to effect savings in material costs, it is desired to replace malleable with gray iron for these parts. Such a move, however, has not been found practicable when using steel tools, on account of difficulties in facing and boring which have invariably been encountered whenever the substitution has been attempted. The method of performing these operations on the malleable spaces is to use two boring bars—one for the two bore diameters, another with two blades for facing both ends to length simultaneously—on a lathe, all cuts being about $\frac{3}{32}$ in.

The advent of tungsten-carbide tools, however, is making the desired move possible. Experimental work on this job has not yet been completed, but it is indicated that these operations will soon be carried out on gray iron spacers on a drill press, using two double counterboring tools, each of which will face one end and bore the adjacent diameter. Each tool has six boring and six facing blades. The rate of production is expected to be double that of the present method. Not allowing for possible increased tool cost, the saving will probably be $1\frac{1}{2}$ c. in labor and 1 to $2\frac{1}{2}$ c. in material, per piece; and, in addition, the part will be superior to its predecessor.

Cutting Alloy Steel

We have been cautious in applying tungsten carbide to the machining of steel. Nevertheless, there is at present one important job on which a saving is being made by its use. Bevel-drive gear forgings, usually of $3\frac{1}{2}$ per cent nickel steel, were formerly made with minimum machining allowances of $\frac{1}{16}$ in. on backs and $\frac{1}{16}$ in. on faces. The initial operation was to take a fairly heavy facing out from the backs of the forgings on heavy machines with high-speed steel tools. Owing to the powerful chucking required, an occasional forging was distorted so that, when it was removed from the machine after the cut, the back would not be quite flat. This condition caused trouble in subsequent operations.

The present method is to specify 0.070 in. allowance for machining on the face and merely to clean up the forge shop excess of $\frac{1}{32}$ in. to $\frac{1}{16}$ in. from the back with a tungsten-carbide facing tool, on a lathe. This means that a comparatively thin cut is taken on a surface so abrasive and at a speed so high that a high-speed steel tool will not finish one piece. The remaining operations on the gear blank—turning, boring and facing—are handled in two set-ups on large vertical automatics.

The speed of the initial facing cut on a typical forging, which is $8\frac{1}{2}$ to 10 in. in diameter, is 120 r.p.m., or 267 to 314 ft. a minute. The feed is 0.020 in. A tungsten-carbide tool will face 150 to 175 pieces per grind and will have a total life of 3000 to 4000 pieces. Ignoring the former cost of high-speed tools, we find that a tungsten-carbide tool, costing \$24 and facing 3600 pieces, does the

work for 3c. per piece. Against this we place an actual saving of 2 to 3c. in material on each forging, an increase in production of finished gear blanks of at least 50 per cent (on a man-hour basis) and the elimination of warping troubles; the answer is obvious.

It should be mentioned that some difficulty was experienced in obtaining a lathe which would stand up under the high speeds required to make this facing operation economical, and that before such a lathe was used the tungsten-carbide tools gave much trouble in chipping, as a result of lack of rigidity.

Unsuccessful Applications

It is natural that, in seeking for applications on which tungsten-carbide tools will improve the product or lower the costs, some failures will occur. It is fully as important, in the interests of all concerned, we believe, to record operations to which these tools seem to be unadapted as it is to broadcast their successes.

We have been unable to make a cutting-off tool for automatic screw machines which operates successfully; every tool chips very quickly.

We have not been able to make a tungsten-carbide tool work satisfactorily on Multaوماتics; the large overhang permits sufficient vibration to chip the tool.

This alloy has also proved ineffective in rough-turning the outside diameter of the flange of a certain differential case of malleable cast iron, owing to the irregularity of depth of cut.

We are still having some difficulty in either purchasing or manufacturing multiple-edged facing tools from which the tungsten-carbide blades will not pull out during operation.

We are attempting to face the backs of differential side gears; though we have some hope of ultimate success, our efforts have thus far produced but erratic results. A flat-faced tool $\frac{1}{8}$ in. wide, feeding forward into the work 0.0017 in. each revolution under a speed of 100

ft. a minute, has not performed consistently. In one case, for example, 4700 pieces were faced in this manner before the tool needed regrinding; another time the tool broke so badly that it was ruined when less than 2000 pieces were faced.

In general we may say that the heavy pressures encountered in facing with a flat-nosed tool, or in end-milling, have made these operations very difficult to perform with tungsten-carbide tools. The locking of the tips or blades seems at present to be the only solution.

Conclusions

It is evident, from our experience, that tungsten-carbide alloys are to have an important place in the fabrication of ferrous metals. The occupying of this place will come, however, only after careful investigation of all likely applications. And progress in this direction will necessarily be gradual and slow, especially in view of the very high price which must at present be paid for the alloy. Although it is further evident that the next move in the continuous battle between machines and tools is now up to the machine builders, we nevertheless firmly believe that the future of these alloys as factors in efficient manufacturing is in the hands, not of the makers of the tool materials nor the builders of the machines, but the users of machine tools.

We wonder, also, as to the fate of the present tungsten-carbide alloys when they shall be required to work on machines which have begun to grow a bit old in service. Will it be possible to construct machines that will remain sufficiently rigid and vibrationless, throughout lives of reasonable length, to permit these tool materials to operate without chipping? Or will it become necessary to develop new alloys, possibly with tungsten carbide as the base, but containing larger amounts of cobalt or other metal, which will be stronger and tougher than the present alloys even at some sacrifice of hardness? These are questions which must soon be answered.

Selection of Steel for Springs

ALL the spring steels commonly used in Great Britain have been studied at the National Physical Laboratory, and the results reported to the Iron and Steel Institute from 1926 to 1929, of which the adjoining table gives a summary.

Fatigue tests were made on small polished specimens cut from $\frac{3}{8}$ -in. flat bars, and the endurance is considerably higher than can be expected from commercial spring leaves, with roughened and frequently decarbonized surfaces. The results are comparative, however. A high fatigue limit is necessary for a long-lived spring. A high proportional limit is necessary to prevent "settling down"

in use. High Izod toughness should indicate resistance to the growth of surface cracks.

It will be noted that several steels show good toughness when tempered to 350 Brinell, particularly the high chromium and the chromium-vanadium steel; in the medium hard condition the latter is superior to all others; in the hardest condition the steels are all comparatively brittle, but the water-quenched silico-manganese steel is nearly as tough as the more expensive chromium-vanadium. The 0.46-per cent carbon steel appears to be a definitely inferior quality. All the steels have an elastic modulus close to 30,000,000 lb. per sq. in.

Physical Properties of Quenched and Tempered Spring Steels

Steel	Chemical Analysis						Quenched from (a)	Tempered to 350 Brinell			Tempered to 410 Brinell			Tempered to 470 Brinell		
	Carbon	Manganese	Silicon	Nickel	Chromium	Vanadium		Endurance Limit	Proportional Limit	Izod	Endurance Limit	Proportional Limit	Izod	Endurance Limit	Proportional Limit	Izod
0.46 carbon	0.46	0.51	0.09	...	...	...	810 W	81,000	90,000	17	81,000	100,000	3	...	...	...
0.6 carbon	0.60	0.77	0.21	...	...	...	800 W	83,000	...	27	87,000	...	12	103,000	...	8
0.8 carbon	0.82	0.41	0.25	...	...	...	950 O	85,000	120,000	19	92,000	130,000	13	108,000	150,000	2
Low chromium	0.60	0.62	0.26	...	0.56	...	900 O	87,000	83,000	12	...	...	...	...	...	...
High chromium	0.45	0.69	0.12	...	1.14	...	800 O	85,000	108,000	23	94,000	150,000	14	105,000	170,000	5
Chromium-vanadium	0.55	0.68	0.29	...	1.16	0.27	820 O	85,000	108,000	50	92,000	140,000	17	112,000	155,000	12
Silico-manganese	0.54	0.94	1.95	...	...	...	850 O	92,000	112,000	45	96,000	140,000	23	99,000	155,000	13
Nickel-chromium	0.36	0.50	0.29	3.42	0.60	...	870 W	87,000	120,000	19	103,000	155,000	14	112,000	185,000	11
							950 O	87,000	115,000	17	103,000	135,000	12	108,000	150,000	9
							820 O	92,000	120,000	30	99,000	135,000	15	112,000	135,000	5

(a) O means "quenched in oil"; W means "quenched in water."

Mechanical Engineers at Rochester

Discussions Include Tungsten Carbide, Diamond Tools,
Industrial Training, Materials Handling, Manage-
ment and Other Topics on Program

NOTABLE among the 15 sessions of the Rochester, N. Y., meeting of the A. S. M. E., held at the Sagamore Hotel May 13-16, were those devoted to machine shop practice. The society's committee on education and training for the industries also arranged a program of unusual interest.

In all 35 papers were presented at the 15 sessions. These included materials handling, management, wood industries, mechanical springs, applied mechanics, boiler furnace refractories, boiler feed water studies, heat transmission and economizers and preheaters. More than 15 technical committees held meetings.

Entertainment features included an informal get-together at the home of Miss Kate Gleason, life member of the society, and a dinner at which Dr. C. E. K. Mees, director of research laboratory, Eastman Kodak Co., was the principal speaker.

Plant visits, made each afternoon, included the Bausch & Lomb Optical Co., Gleason Works, Taylor Instrument Co., Garlock Packing Co., Kodak Park works of the Eastman Kodak Co., General Railway Signal Co., Todd Co., Stromberg-Carlson Telephone Mfg. Co., General Railway Signal Co. and the Bastian Brothers Co.

Reports on Use of Tungsten-Carbide Tools

UNUSUAL interest was evidenced in two reports on tungsten-carbide cutting tools, which were presented at the first of the two machine-shop practice sessions. These were "The Status of Tungsten Carbide as a Cutting Material,"* by the Subcommittee on Machinability of the A. S. M. E. Special Research Committee on Cutting of Metals, of which F. C. Spencer, Western Electric Co., Kearny, N. J., is chairman, and "Tungsten Carbide Cutting Tools," a joint report by Paul Eddy, Jr., assistant metallurgist, and H. J. Long, chief experimental engineer, Brown-Lipe-Chapin Co., Syracuse, N. Y. Active interest was also shown in the contribution of C. L. Bausch, manager of research and engineering, Bausch & Lomb Optical Co., on "Diamonds as Metal Cutting Tools."†

One came away from these discussions with a definite feeling that

"new things are in the making." For instance, the committee's report cited the following instances of increased life of tool by means of tungsten-carbide tools:

In machining a bronze valve disk on an automatic chucking machine, the life of the tungsten-carbide tools is 27,000 pieces per grind, compared to 600 to 800 pieces with steel tools. On a malleable iron part having brass inserts, also machined on an automatic, the life of the carbide is more than 6 weeks, compared to 3 to 8 hr. operation per grind with steel tools.

In drilling bakelite with a 9/16-in. drill, tools tipped with tungsten carbide produced 10,700 holes per grind, compared with 155 with steel drills. In drilling and counterboring bakelite-asbestos clutch plates the production is 50,000 holes per grind, as compared with 1000 with high-speed steel.

The Brown-Lipe-Chapin Co. has adopted the tungsten-carbide tools as standard for a number of operations on malleable iron castings. On one piece the production per grind jumped from 200 to 7000 pieces. On another, line reaming pinion bores of differential carriers, the steel reamers produced about 1500 pieces per grind, with a total tool life of 6000 pieces, while the carbide tools average 9500 pieces per grind, and the life of the reamer is approximately 28,500 pieces. Better finish and less size variation were said to be obtained also. Results in cutting gray iron and alloy steel, as well as data on unsuccessful applications of the tungsten-carbide material, are set forth in the paper, which is abstracted in this issue.

In diamond tools surface speeds of 1000 ft. per min. are being obtained without affecting the life of the tool. In speaking of speeds of turning, Mr. Bausch said that the "surface has not been scratched, so to speak, in this direction. The main limiting factor seems to be that of vibration." This, he indicated, calls for machines built for the higher speeds without introducing chatter.

That the diamond tools provide not only a cutting action, but a burnishing action as well, was emphasized by Mr. Bausch. Tungsten-carbide tools have an important place, especially in large production, he said, but the burnishing action of the diamond tools is not obtainable with those of tungsten carbide. The diamond is not suited for roughing cuts. On the

work at his plant, the carbide tools might be used for roughing and the diamond tools for finishing. By the use of the diamond, buffing operations are entirely eliminated, and the mirror-like finishes emphasized by Mr. Bausch, as obtainable with the diamond tools, were more than borne out by the work being done and seen during the visit to his plant.

The status of the tungsten-carbide tools and the probable effect on machine tool design as outlined in the subcommittee's report was taken as a fair statement of the matter. And the experience at the Brown-Lipe-Chapin Co. plant, as stated by Messrs. Eddy and Long, leads to the definite conclusion that the tungsten-carbide materials are to have an important place, which will be obtained, however, only after careful investigation of all likely applications. To quote from the paper: "Progress in this direction will be gradual, especially in view of the high price of the alloy. Although it is further evident that the next move in the continuous battle between machines and tools is now up to the machine builders, we nevertheless firmly believe that the future of these alloys, as factors in efficient manufacturing, is in the hands of, not the makers of the tool materials or the builders of the machines, but the users of machine tools.

"We wonder, also, as to the fate of the present tungsten-carbide alloys when they shall be required to work on machines which have begun to grow a bit old in service. Will it be possible to construct machines that will remain sufficiently rigid and vibrationless throughout lives of reasonable length to permit these tool materials to operate without chipping? Or will it become necessary to develop new alloys, possibly with tungsten-carbide as a base, but which will be stronger or tougher than the present alloys, even at some sacrifice of hardness? These are questions which must soon be answered."

In discussing the papers dealing with tungsten carbide, E. F. DuBrul, general manager of the National Machine Tool Builders Association, expressed himself in favor of a comprehensive general research into the possibilities and limitations of the material. Funds for the purpose to the extent of \$500,000 or more should be contributed by the entire metal-working industry, rather than by the machine tool builders alone.

Extensive redesign, on the strength

*Abstracted in THE IRON AGE of May 16, page 1349.

†Abstracted in THE IRON AGE of May 16, page 1344.

of our present beginner's knowledge of the place in the scheme of things of the tungsten-carbide tools, would be rash, he indicated. He recalled the groping of the machine tool industry when high-speed steel was introduced and pointed out that there were three or four cycles of design before machine tool builders caught up with the high-speed steel tools. If the proposed research is conducted, wasteful redesign might be largely prevented.

Mr. DuBrul also pointed out that, because of the more open-minded attitude toward changes as compared with that of thirty years ago, the coming revolution in design and cutting tools will be more rapid than was the case with high-speed steel.

Winfield S. Huson, Carboloy Co., Inc., New York, took occasion to correct what he called a somewhat misunderstood idea of the tungsten-carbide-cobalt structure. It is well to point out, he said, that while the bases are metallic, it is not a metal in the usual sense of iron or steel. It is a cemented product, produced under careful laboratory supervision and subjected to great pressure and to intense heat in a hydrogen atmosphere until it becomes a hard cemented product, hard because tungsten carbide is inherently hard and cannot be changed in that characteristic. Held in a cobalt bond, it gives toughness and results in the material being made available for cutting tools. "It is a costly material, as will be readily sensed by the process of manufacture, but when put in production the cost is so quickly absorbed in the increased output, and in many instances better, that its use becomes imperative."

Carboloy type tools, he added, have entered the lists on the battle of intense production and are making such wonderful progress that the utility and value are established and carry the assurance of having a permanent place in the intensity of modern production.

Diamonds for Metal Cutting

Among others who discussed the Bausch paper on diamonds for metal cutting was Winfield S. Huson, Carboloy Co. He agreed that the author's point is well taken, that "the limiting factor seems to be that of vibration." Vibration concentrating on a tool creates a great stress, chatter and possibly fracture, whereas if the vibration could be soaked up in the machine tool proper, the diamond tool would be still more efficient. This applies as well to cutting tools of the tungsten-carbide-cobalt class, he added, which closely approach the diamond in hardness and ability to produce work. While Carboloy-type tools, he said, will not give the ultimate fine finish of the diamond, they are a desirable adjunct to it in that by their hardness and close approach to the diamond they can be used to rough cut in advance of the diamond final finish, because they are of much more substantial size and strength, and in

this way are a saving on the harder work on the diamond point.

Motorization of Machine Tools

THERE is room for considerable improvement in the methods employed in determining the correct size of motor upon individual machines, said W. W. Nichols, vice-president and mechanical engineer, D. P. Brown & Co., Detroit, in a paper, "Economies Which May Be Effected in Power Transmission." This will be of valuable assistance to both the machine-tool manufacturer and the user. There are two sides to this question—the manufacturer's and the user's. Often the manufacturer does not receive from the user a definite description of the work to be performed upon the machines, and the manufacturer recommends the size of motor sufficient for the maximum cut the machine is capable of pulling, which results in all probability in a very low power factor.

If the user would inform the manufacturer regarding the class of material to be operated upon and at what feeds and speeds, the latter would be able to determine the most satisfactory size of motor. But a still better method would be for the user to send sufficient of his material to the machine-tool maker for him to experiment upon and determine what would be the maximum production of the machine. There is room for a more thorough investigation by users of machine tools to determine the maximum production which machines can develop.

Tests Often Show Present Tools Adequate

Instances of this were brought out in one plant, where a testing outfit was used, indicating that production in some instances could be doubled without injury or increased grinding of tools. Other instances have occurred where requisitions for additional tools were proved to be unnecessary after tests were made. Some interesting facts developed regarding the determination of motor sizes for machine tools while the author of this paper was assisting A. F. Denham of *Automotive Industries* in the compilation of data.

The electric motor survey conducted by the National Machine Tool Builders' Association, covering all industries, showed motor sizes were specified as follows:

	By the Tool Manu- facturer	By the User	By the Dealer	Not Speci- fied
Fractional hp.	89%	8%	2%	1%
1 to 10 hp...	37%	47%	15%	1%
10 to 15 hp..	30%	57%	13%	...

Mr. Denham says, "This would seem to indicate that, taking all industries together, as the sizes of motors increase, more and more of the specifications come from the purchaser. Peculiarly enough, this does not seem to apply to the automotive

industry, to judge by replies from a number of leading machine-tool manufacturers.

"Thirteen out of fourteen of the largest manufacturers from whom replies were received state that they customarily specify all motors for machine tools for the automotive industry, the tools representing all types and including much special machinery.

How Motors Are Specified

"Manufacturers from whom replies were received can be separated into four groups. In the first and largest group are those who clearly state that it is their custom to specify a motor size which will take care of the maximum load capacity of the tool, without reference to the type of work for which the tool is to be used.

"In the second group can be placed those manufacturers of machine tools who offer more than one motor size for a specific tool. It will be noted, however, that even these make no effort to determine actual power requirements.

"In the third group are classed those manufacturers who determine motor sizes by computations of power required for the specific operations for which the machine is intended, basing this, by means of an empirical formula, on the amount of metal removed.

"Two manufacturers only among those replying are in the fourth group, those who actually determine the horsepower requirements by test."

Too Much Power Installed

From these quotations the chaotic condition this motorization of machine tools is in can be seen. In further substantiation of these remarks, a chart was taken from a Moline Hole Hog used in finish-reaming cylinder blocks. The machine was equipped with a 15-hp. motor, whereas less than 5 hp. was required for the operation.

In one plant with which the author is familiar, 235 tests were made upon motor-driven tools and group drives having a total of 2100 motor hp. connected. After these tests were made, reductions to the amount of 1100 hp. were made in connected motor horsepower, some of the lineshafts of the groups showing a friction load of 56 per cent.

Group Drive

The question of individual drive for machine tools or of group drive for them provides many arguments for and against each system. There is no question that smaller total motor horsepower is required for group drive than for individual-motor drive. Take as an example a battery of ten polishing stands which can be driven by a 20-hp. motor as a group, but if individually driven a 5-hp. motor is required for each stand to take care

(Concluded on page 1462)

Thresh Out Open-Hearth Problems

Operating Men Hold Semi-Annual Meeting—Furnace Refractories a Live Topic—Insulation of Regenerators—German Furnace Practice

OPENING the ninth semi-annual meeting of the open-hearth committee of the American Institute of Mining and Metallurgical Engineers, which was held at Hotel Cleveland, in Cleveland, May 16 and 17, Leo F. Reinartz, chairman, traced the growth of the steel industry over the past 15 years, and showed particularly how this growth had been dominated by a still faster growth of basic open-hearth operation. Whereas capacity for steel making has increased only 18 per cent in the last 10 years, open-hearth capacity has increased 34½ per cent.

Of this open-hearth gain in capacity, 40 per cent came from the building of new furnaces. The remainder was a result of scrapping old operating equipment and making use of new, in many ways, to speed up output, relieve manual labor and avoid delays. Companies have spent millions of dollars in efforts to improve quality of product and to lessen operating costs, but with these results there has resulted inevitably an increase in tonnage from the furnaces.

Interchange of ideas, particularly as regards methods of operating furnaces and achieving definite results, has become a matter of common practice. The day of rule of thumb and of secrecy is distinctly of the past.

Mr. Reinartz recommended appointment of standing committees for study of technical progress along 10 sharply defined lines. These will cover respectively

- Refractories
- Steel melting practice
- Organization—crews, labor-saving devices, etc.
- Pouring practice
- Combustion control
- Auxiliary equipment—valves, water cooling, cinder buggies, etc.
- Materials of construction
- Quality control—rimming steel
- Quality control—killed steel
- Fuels

For nominating officers for the next year, a committee was appointed consisting of J. M. Hughes, Sharon Steel Hoop Co., Samuel B. Muir, Donner Steel Co., and Ernest A. Smith, Andrews Steel Co. Nominations made for chairman, vice-chairman and secretary, and presented at the close of the last technical session, Friday noon, were approved unanimously by the operating men. Leo

F. Reinartz, assistant general superintendent, American Rolling Mill Co., Middletown, Ohio, continues for a second term as chairman. Roy L. Leventry, superintendent of open-hearth and blooming mill departments, Youngstown Sheet & Tube Co., Youngstown, becomes vice-chairman. W. E. Buck, metallurgist, Granite City Steel Co., Granite City, Ill., is the new secretary.

A matter of business brought up by the chairman had to do with the question of continuing the present practice of having steel foundry open-hearth men participate in the meetings with the open-hearth men concerned primarily with making steel ingots. After considerable discussion, in which men representing steel foundries took part, it was decided to continue the present arrangement. Men from the steel mills stated that they obtain a good deal of benefit and many worthwhile suggestions from the men in the foundry end, and the foundrymen stated that they obtain much benefit from the ideas of the steel mill operatives.

As has been the case with these meetings for some time, there were no papers read. A series of topics for general discussion had been drawn up, those for the first session covering, in general, furnace refractories and materials of construction. The second session was based on furnace construction and operation; the third on control of quality in the product. Largely an "experience meeting," the men present gave their views on topic after topic, under the guidance of the chairman. And, as before, they consistently "talked shop"—at lunch, in the hotel lobby or wherever they happened to be. Registration totaled 84.

The meeting closed with a visit to the Riverside plant of the Otis Steel Co. Here are eight open-hearth furnaces, the three latest (1928) tapping 140-ton heats and the five others 125 tons in place of their 100-ton rating.

Loftus Checker Installations

ONE speaker reported noticing some advantage from Loftus brick used in furnaces burning producer gas. He uses them in the air chamber only, having straight 9-in. brick in the gas chamber. At the end of a run the dirt on the Loftus checkers is confined to about four courses of brick, which get very dirty

because it is impossible to blow these furnaces. Two new furnaces at this plant are almost finished, with Loftus brick in both chambers.

Another plant has three sets of Loftus silica brick in place. Only one of these has been much operated as yet; this has made 510 heats in two runs. The checkers have deteriorated considerably, their section having become smaller. These were in the air chamber, 10½-in. brick being used in the gas chamber. On the second of these two runs, silica checkers were put in the gas chamber. All deposits were found down in the bottom between rider walls, which are 44 in. high. After the 510 heats about 25 per cent of the silica brick were reclaimed. The air openings are 6 x 9 in. and the gas openings 6 x 6 in.

Another operator reported finding Loftus checker brick a great improvement. In his case they reduced the time of making the heat about 45 min., and lowered the oil consumption 1½ gal. for each ton of steel. These furnaces are not burning out along the skewbacks so fast as before. The regenerator chambers are running much hotter than with 10½-in. brick. Dirt clings to the checkers about two-thirds of the way down. The brick were cleaned after two runs, and about 65 per cent were recovered.

In another plant, where Loftus brick were used in the gas chambers and 9-in. brick in the air chambers, the furnace was stopped after 295 heats because the air chambers were clogged up. It was found that the Loftus brick were burned out badly. In rebuilding, Loftus brick were put in both chambers. After 200 heats, there was a 3-in. deposit of dirt on top for about five courses. The fuel is producer gas and the heats are tapped at a high temperature between 2900 and 3000 deg. Fahr.

One speaker stated that the cost of putting Loftus brick in all four chambers was about \$1,200 more than the straight brick previously used. Another estimate was 40 per cent above the previous cost. Still another placed it at 23 per cent up. To offset this extra cost, one operator reported having had previously a practice standardized at about 200 to 225 heats maximum, and having gone up to 510 heats on a run with the Loftus brick.

Another man reported better steel production with Loftus brick to the

extent of 0.9 ton an hour. Stack temperatures were reported by one speaker to be lower with the Loftus brick, as more horsepower is obtained in the waste-heat boiler from the standard brick. Another man, however, reported a condition just the reverse of this.

Chrome Brick for Lining Pan

IT seemed to be the general consensus of opinion that it is impossible to tell the difference in service between chrome and magnesite brick put in the pan in building an open-hearth furnace. Each one will do the work required of it, and holes burnt in the bottom seem to affect them about equally. One plant put in a chrome brick bottom four years ago in one furnace, and this seems to have about the same number of holes, from time to time, as the other furnaces.

One speaker reported that the magnesite sintered into the bottom of the furnace, in making the bottom above the brickwork, sets just as well against chrome brick as against magnesite brick. He was referring to a bottom which has a total depth of 21 in. in front of the taphole.

Another man found, on making a general repair, that there was a certain amount of steel down on the clay brick when old bottoms were torn out. This had gone through the magnesite but had not penetrated the fire-clay brick just inside the pan. This plant has never used chrome brick in this position. Another speaker described his practice as laying two courses of fire brick flat inside the pan, then one course of chrome brick on edge and a course of magnesite brick on edge on top of the chrome. This has worked well and has not given trouble.

Some trouble was reported from the use of chrome brick in the ends of furnaces. In one case four courses were laid above the cinder line. Unburned magnesite was used to replace this, and only 25 heats were obtained on it against 150 heats previously. Another speaker said that chrome brick will spall more rapidly around a slag line than magnesite brick.

Another method of making a new bottom was reported as the use of clay brick with chrome brick on top of the clay bottom, and then 9 in. of loose magnesite sintered in place in thin layers.

One man who reported having a bottom made with chrome brick stated that it cuts away at the metal line. It is good above the bath, but he does not want it below the metal. Unburned magnesite brick on the backwall were reported to corrode pretty rapidly along the banks, but the frontwall is not burning out any faster.

Lining of Furnace Ports

AS much as 30,000 to 40,000 tons of steel was reported on some large furnaces in which the port

lining was made of Carbofrax. This lasted nearly two runs of 150 to 200 heats each. Another man reported getting 150 heats from a dry port made of silica brick, and using producer gas. The port then will last 125 heats more after the checkers have been blown out. In another case dry ports of silica brick were reported shaped up with chrome ore. Another speaker found best results from the use of a special patented brick, from which he obtained 307 heats.

Comparison of a number of materials was made by another operating man, who found that two of the substances used gave him about equivalent results of 65 to 70 heats. Another material which he mentioned gave only 14 heats, whereas the Carbofrax gave him an average of 176 heats and therefore has been adopted as standard in his plant. Another man reported getting 300 heats from a Blaw-Knox port.

Patent Refractories vs.

Magnesite

AMERICAN magnesite was given the preference by most of the speakers discussing this topic. In some cases Canadian magnesite was favored, but, contrary to the reports some time ago, the Austrian product was no longer considered as satisfactory as that made in America. Principal among the advantages of the American magnesite is the more even grading by size.

One operating man uses a large quantity of local burned dolomite, 35 lb. or so to the ton of steel, in addition to 20 or 25 lb. of raw dolomite, and about 7 lb. of magnesite. Another man uses no magnesite at all, but on straight scrap heats he uses 21 lb. of double burned dolomite and 68 lb. of raw dolomite. One operator reported using burned dolomite and a small amount of American magnesite in place of his former practice of using raw dolomite in conjunction with Syndolag.

Syndolag, however, was favored by another speaker, who uses 15 or 20 lb. of it to each ton, in conjunction with 35 or 40 lb. of burned dolomite, and 4 or 5 lb. of magnesite. This plant makes almost wholly dead soft steel. In this case, raw dolomite does not stand up well. The magnesite is of American production, as this is well sized. Another man who uses the American magnesite, uses also a certain quantity of Gran-ite.

In making bottoms one open-hearth man reported using Canadian magnesite with burned dolomite and a few pounds of Magnifer. He finds the Canadian magnesite as good as the Austrian. Still another man uses about 70 lb. of raw dolomite with 20 lb. of Kendolag and 1 or 2 lb. of magnesite. Another man reported that he would use magnesite for deep holes, but ordinarily uses very little of it, as Syndolag and raw dolomite suffice.

Elimination of trouble from hard

tapholes was reported by one man through the use of Basafrax to shut the taphole. In this case no heats are made above 0.06 per cent carbon and hard taps had been the rule before. Another man makes all large patches with American magnesite, but otherwise uses principally Syndolag with both raw and burned dolomite. Still another practice is the use of Austrian magnesite for new bottoms, American magnesite for bad holes, Magnifer for rapid patching, and a combination of Magnifer, magnesite and raw dolomite for general work.

One man reported, upon a two-year average consumption, showing 57.3 lb. of raw dolomite, 23.6 lb. of synthetic dolomite, and 0.3 lb. of magnesite for a ton of steel. This is on furnaces tapping 112 tons and allowing 35 min. for making bottom. The average bottom delays for a year were 6½ min. to the heat, this being all time beyond the 35-min. allowance.

Making Bottom with Dolomite Gun

Use of a dolomite gun was reported to cut down the bottom-making time in one case from 45 min. to 25 min., and sometimes to 20 min. Another man with very large furnaces reported an allowance of 45 min., which was reduced to 30 min. in his smaller furnaces.

In another case a gun reduced the time from 1 hr. to 45 min. Other men reported getting bottom made in about 8 min. with the gun, putting the material on while the banks are still so hot that the material will stick and not run down. One practice was cited in which very fine dolomite is used, with the gun, the average for 1928 having been 103 lb. to the ton, with 7 lb. of magnesite.

Comparison of Brick Life in Roofs

ONE operator having a suspended flat roof reported that the brick will spall quite rapidly. He reported roof costs of 21c. to the ton, but said that this is recovered by lower costs in other directions, and that that particular furnace is running low on cost. It is making steel on about 5,800,000 B.t.u. to the ton.

Using straight backwalls, one operator reported a roof 15 ft. 3 in. in width (span) with 13½-in. brick and 18-in. ribs. In the same plant furnaces of the same size with sloping backwalls have roofs about 19 ft. wide, using 18-in. brick with 22-in. ribs. Another speaker having exceptionally large furnaces reported a roof span of 24 ft. with a rise of 28 in. He uses brick 12 in. and 15 in. thick with 18-in. ribs, and has had no buckling.

Another man using 12-in. brick with 16-in. ribs, on 15-ft. width, has made as many as 515 to a maximum of 549 heats of 110 tons each in a run. This was with oil as fuel, but similar results have been obtained on tar.

Furnace roofs with 12-in. brick were reported giving 250 heats on the roof center, whereas 650 heats can be obtained on the ends of the same roof. In another case, with a semi-sloping backwall, 12-in. brick with 15-in. ribs were reported giving good service on 110-ton furnaces with a 22-in. rise of arch in the roof.

Sloping backwalls with a 19-ft. span and 26-in. rise in another plant are made of 22-in. brick for the 10 courses nearest the front and back skewbacks; then 18-in. brick and in the center 16-in. brick with 18-in. ribs. These are giving about 100 heats better life than was had formerly.

Insulation of Regenerators and Flues

TO avoid infiltration of air, any covering for insulating purposes on regenerator sides, ends or roofs,

a steel plate box, inside which is an insulating lining of $4\frac{1}{2}$ in. of Silocel covering the 18-in. fire-clay brick walls of the chamber. The 12-in. roof is covered in the same manner. Another operator, however, using oil as fuel, reported having had 4 in. of Silocel on the roofs of the chambers and having had to take it off, as the chambers got too hot. Another man has had $2\frac{1}{2}$ in. of 3C cement on regenerator roofs for six years, and reports it satisfactory.

To show how much infiltration of air takes place, one man reported having insulated the roofs, sides and ends of both the chambers on a natural gas furnace, and said that then he could not get enough air. He had to double the capacity of his air valves. After this correction was made, the furnace made steel in 2 hr. better time to the heat. Another speaker uses 18-in. chamber walls, including the $4\frac{1}{2}$ in. of Silocel in-

Sections were shown by the chairman of the Moll open-hearth furnace, operating in Germany, and reported to be making unusually fast time. The regenerators are exceptionally deep, and the stack is 217 ft. tall, on a 33-ton furnace. There is a water-cooled port opening of the damper type, by use of which the furnaceman has available a certain control over his flame conditions.

Another form of furnace in use in Germany was shown by B. deMare, consulting engineer, Philadelphia, who explained its working. The regenerators consist of three parts: a first fore, second fore and the main chamber. This is shown, diagrammatically, in the sketch. The device is named for its originator, Keen, general manager of a steel plant near Cologne. Mr. deMare said that a similar type is being installed by the Worth Steel Co., Claymont, Del.

Prefacing his description of the Keen furnace with an indictment of the present high fuel cost and heavy refractory consumption, high labor cost and short life of existing open-hearth furnaces, the speaker said that their operation is so irregular that it is difficult to make the same quality of steel, heat after heat. It is the aim of the Keen design to overcome much of this disability, and the arrangement of refractory surfaces in the regenerators is the method adopted.

How the Heat-Absorbing Surface Is Arranged

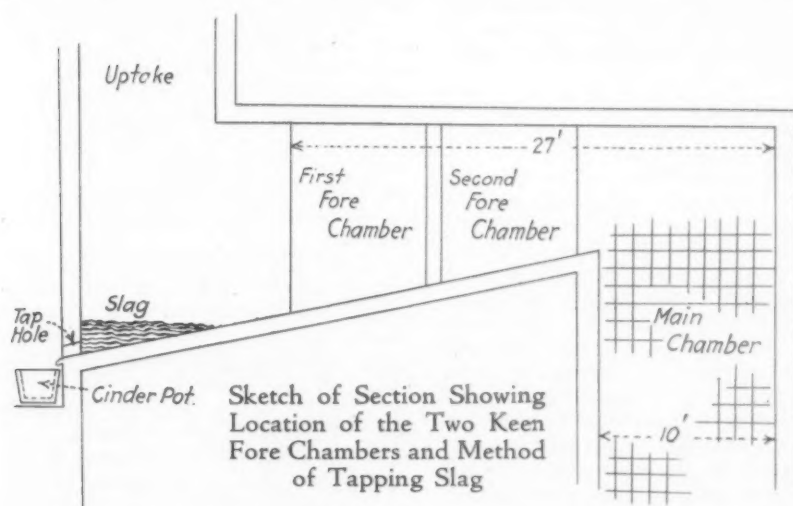
Each of the four chambers is 27 ft. long, as in standard practice for the size involved. Widths are 15 ft. for the two air chambers and 7 ft. for gas. But, instead of using the whole 27 ft. for the conventional laying up of brick, the design calls for the two fore-chambers preceding the main chamber. The latter thus becomes only 10 ft. long, but of considerable depth.

Parallel walls running in the direction of gas and air travel constitute the two fore-chambers. The first consists of walls, of refractory brick, 9 in. thick, with $4\frac{1}{2}$ -in. space between for passage. The second is similar, except that the walls are only $4\frac{1}{2}$ in. thick, with the same $4\frac{1}{2}$ -in. passage between walls. The main chamber has straight 9-in. brick, and the openings are $3\frac{1}{2} \times 3\frac{1}{2}$ in.

A particular feature lies in the fact that the slag is tapped about twice a week, thus avoiding the usual accumulation. It will be noted, from the sketch, that there is no slag pocket of the customary type. But the bottom of the fore-chambers slopes well downward, toward the uptake end. Temperatures are said to be high enough so that the slag carried over with the gases readily runs down to the taphole, and no difficulty is experienced in tapping it out.

This last statement gave rise to

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or on flues or gas mains, must be sufficiently plastic so that it will not crack with the heating and cooling to which it is subjected. One man reported using a coating of $\frac{1}{8}$ in. thickness put on with a cement gun. This consists of Binderene mixed with fire clay.

Other speakers referred to using Silocel brick of varying thicknesses for roofs or walls of regenerators, or both. In some cases expansion was found to cause trouble, as the material often bakes and cracks off within a few weeks. The expedient was reported of using two thin layers with the joints broken, and this was reported to overcome the trouble.

In one case Weber 2-4-1 was put on about three months ago and is reported to be still plastic and looking very good. Another man reported good results from Weber 48. In still another case Vanroc plaster $\frac{1}{2}$ in. thick, put on with a trowel and coated with tar, has been in place for two years on the sidewalls, and is standing up very well.

Two new furnaces in a Canadian plant are being equipped with all the latest refinements for operating control and avoidance of trouble. In these cases the regenerators are in

isolation, which covers the roof also. The foundation is insulated with 3C cement. Some other large furnaces are provided with $2\frac{1}{2}$ in. of Silocel and steel plates, both on the chambers, and on those portions of the flues which are above the ground.

It was strongly urged by one speaker that, after the insulation is put on, the furnace operator must determine just how his practice can best be fitted to the conditions then existing. There should be a definite gain resulting from the use of the insulation, but this can come only from a study of how best to fit operating conditions into the unit.

Methods for Laying Checkers

ABANDONMENT of straight 9-in. checker brick and adoption as standard practice of $3 \times 4\frac{1}{2} \times 10\frac{1}{2}$ -in. brick was one report. The openings are less clogged after the run and there is a larger reclaim percentage from the larger brick. Blocks of $4\frac{1}{2} \times 4\frac{1}{2} \times 10\frac{1}{2}$ -in. size were seen in operation at the Otis Steel Co. plant visited. These were laid with an unusually large opening— $10\frac{1}{2} \times 10\frac{1}{2}$ in., and were said to be performing satisfactorily.

Sheet Distribution Ills Attacked

Metal Branch of National Hardware Association Takes
Steps to Remedy Situation—L. D. Mercer of Central
Alloy Steel Corporation Submits "14 Points"

RADICAL steps to place the distribution of sheet steel on a profitable basis, to eliminate sales policies that long have been the cause of contention between sheet manufacturers and jobbers, the establishment of resale prices for sheets and the setting up of a list of recognized jobbers were proposed at the eighteenth annual meeting of the Metal Branch of the National Hardware Association, held at the Statler Hotel, Detroit, May 16 and 17. The plan outlined also provides for the reorganization of the Metal Branch with the elimination of sheet steel manufacturers. At present the membership is composed of both jobbers and manufacturers.

The remedies proposed for putting the jobber's business on a better basis were included in 14 suggestions offered by L. D. Mercer, Central Alloy Steel Corporation, Massillon, Ohio. These seemed to receive the approval of a considerable number of the members. Another recommendation offered with a view of remedying ills from which the sheet steel distribution industry is suffering was that the whole subject be turned over to the Federal Trade Commission. This recommendation was included in a report of the trade practice conference committee.

Another matter in which the jobbers showed a very lively interest was the reduction from 2 per cent to $\frac{1}{2}$ and 1 per cent made by the mills last year of the 10-day cash discount on sheets. Jobbers expressed themselves very emphatically in opposition to the reduced discount and showed their determination to continue the fight to have the 2 per cent discount restored.

A brief address of welcome was made by A. H. Nichols, Detroit, president, National Hardware Association. This was followed by the annual address of F. O. Schoedinger, Columbus, Ohio, chairman of the Metal Branch. The greatest value of trade organizations, he declared, is their educational activities. The public is also benefited by these organizations. In the rapidly changing conditions and developments of the present day, competition is not so much between industries in the same line as it is between different industries, one industry threatening to wipe out another by shifting of the consumer from one product to another.

The development of more scientific and economical distribution was urged by Harvey J. Campbell, vice-president

and secretary, Detroit Board of Commerce, in a talk on "Where is Business Headed?" He declared that many unnecessary and economically unsound things are done between the time merchandise leaves the shipping platform until it reaches the consumer. He predicted rapid changes in business and warned that the danger that confronts business men is due to their lack of ability to foresee the changes. Many will be forced out of business by the development of intensive selling.

Mr. Mercer proposed his 14 points in a talk on the distribution of sheet steel. Both mills and jobbers are responsible, he declared, for the unsatisfactory situation in the distribution of sheet steel. The jobbers are facing a critical period in their industry. There must be a change in the method of distribution, but he did not know what the change will be. In cities where there are many jobbers he predicted there will be a great reduction in the number by mergers or the forcing of some jobbers out of business.

Mr. Schoedinger expressed the opinion that if Mr. Mercer's recommendations were adopted they would result in much progress.

Says Jobbers Should Not Ask Mills to Make Direct Shipments

F. R. Meyer, Jr., Inland Steel Co., Chicago, who was also on the program to discuss the distribution of sheet steel, said that if only part of Mr. Mercer's recommendations were adopted, many of the troubles of the industry would be eliminated. He didn't like the idea of jobbers placing orders with mills for direct shipment and said that jobbers shouldn't ask mills to make direct shipments. Some jobbers no longer want to handle sheets because of competition of mills and other jobbers. Cutting prices to increase the volume of business is in his opinion a great mistake. There is only so much business to go around and, if one jobber makes a cut, others meet it and all suffer. In the Chicago territory, he said, the galvanized price situation has improved, although the market is a highly competitive one. Chicago jobbers hold to a \$20 spread above mill prices. W. H. Donlevy, Philadelphia, said that the mills could help the situation by giving attention to the problems that concern them.

It was decided to refer Mr. Mercer's recommendations to the trade practice conference committee with a view of

having that committee take the subject up with the mills and ascertain what the mills are willing to do in connection with the proposed recommendations.

Urges Restoration of 2 Per Cent Cash Discount On Sheets

The subject of cash discount was introduced by Mr. Schoedinger, who declared that the adoption during the year of the one-half to 1 per cent discount for payment in 10 days was a severe jolt to jobbers and that nothing had disturbed the industry so much as the reduction of the discount. He urged the sheet manufacturers to restore the 2 per cent discount, at least on galvanized sheets, if not on black sheets.

By reducing the discount the mills had inaugurated a system that had resulted in a slowing down of the turnover of capital and had done the worst thing that had ever happened in the industry, declared F. J. McNeive, W. F. Potts Son & Co., Inc., Philadelphia. F. A. Heitmann, Houston, Tex., past president of the National Hardware Association, declared that the reduction of the discount had made the distribution of sheets unprofitable and the jobbers had the right to demand that the old discount be reestablished. If it is not replaced, he said, distributors will turn their attention and energies to lines that are profitable. Sheet steel business in Texas is demoralized. Mills sell mixed cars to consumers at as low prices as jobbers can buy in large lots. Jobbers do not want to distribute sheets without some compensation. Mr. Schoedinger also contended that injustice is being done to jobbers because mills are selling mixed carloads of sheets, nails and other products to retailers or consumers at as low prices as they sell to the jobbers. The question arises "Is the Jobber Essential?" If so, the injustice should be remedied.

Replies From Mills on Cash Discount Held Unsatisfactory

A questionnaire that he had sent to the mills relating to the cash discount was read by R. V. Truesdale, Hibbard, Spencer, Bartlett & Co., Chicago. He said his replies were unsatisfactory, as he was unable to get definite information from the manufacturers of their viewpoint. He pointed out that jobbers distribute 17 per cent of the sheets and render a real service and he did not see why the manufacturers

could not differentiate in their method of pricing so that they could have one discount for jobbers and another for manufacturing consumers. It was voted to send copies of Mr. Truesdale's questionnaire to the members.

Mr. Mercer declared that the jobbers are slipping, but that there are more important things for the industry to consider than the 2 per cent discount. Mr. Schoedinger admitted that the industry is slipping and said that it should be supported by the sheet manufacturers. He referred to the taking of mixed carloads by mills as a great injustice to the jobbers.

Opposition to the elimination of the 2 per cent discount was also expressed by J. A. Warner, St. Joseph, Mo., representing the Missouri River Hardware Association, and C. S. Harper, Ottumwa, Iowa, representing the Iowa Hardware Association. The latter said the wholesalers still believe they are right and they should keep up the fight. They are not asking manufacturers to reduce prices, but to have a price that will enable them to give jobbers the 2 per cent discount. It is a great hardship for the jobbers not to get this discount, because they have to give it to their customers.

Federal Trade Commission May Be Asked to Aid Jobbers

In proposing that the ills of the sheet steel jobbers be delved into by the Federal Trade Commission, Robert H. Lyon, Lyon, Conklin & Co., Baltimore, chairman of the trade practice conference committee, said that complete coordination of jobbers is lacking and that the Metal Branch does not have a sufficiently large group of members. Manufacturers, distributors and consumers should be brought together into one group. That jobbers were slipping, he said, was their own fault. After some discussion it was decided that the trade practice conference committee should continue its work and, if it deems advisable, with the sanction of the metal committee, it was authorized to ask the Federal Trade Commission to conduct an investigation of the jobber's problems and grievances.

Present conditions concerning mill direct shipments were discussed by F. J. McNeive. He said there are two groups, one contending that mills should make only carlot direct shipments and others that there should be no restrictions to orders sent by jobbers to mill for direct shipments. He suggested that the minimum direct shipment order from a jobber to a mill be 25 bundles and not less than five bundles of a size. Mr. Donlevy said that there is more of a tendency than heretofore in his territory for jobbers to take small lots for direct shipment and suggested the adoption of quantity differentials for these small lots. As these direct shipment orders are taking business away from warehouses, he thought the manufacturers should charge a differential for less than 25 bundles. Mr. Mercer, representing a producer, thought

there should be no direct mill shipments. A. W. Howe, J. M. & L. A. Osborn Co., Cleveland, made a motion, which was adopted, that the mills limit direct shipment orders from jobbers to 25 bundles or 4000 lb. This, as was pointed out, can only be a recommendation for the mills to act on as they see fit.

Sheet Steel Extension Work Extends to Market Research

Leading activities of the Sheet Steel Trade Extension Committee were outlined by Stanley A. Knisely, National Association of Flat Rolled Steel Manufacturers, Cleveland. These included work in the building field, particularly in respect to the drafting of building codes so that sheet steel will be given its proper recognition and market research studies. He announced that the association had recently completed an extensive research regarding the use of galvanized roofing and siding. This survey showed

that in selected districts in all the States 44 per cent of farm buildings had wood roofs and 33 per cent galvanized roofing, the remainder being slate and composite roofing. If the same owners were to replace their present roofs, the report showed that galvanized sheet would be 46 per cent and wood would decrease to 25 per cent. It was also shown by the survey that 42 per cent of the galvanized roofing was purchased from hardware stores, the remainder coming from six other classes of dealers. The survey also showed, Mr. Knisely declared, that with the use of effective advertising and better salesmanship the use of galvanized roofing would be increased 50 per cent. The association is now making a survey in the urban field, which will include roofing, ceiling, steel buildings, office furniture and various other sheet steel products.

The use of sheet steel should be popularized by advertising in the local newspapers in the opinion of Francis

Fourteen Points Suggested for Remedying Ills of Sheet Steel Distribution

FOURTEEN suggestions as remedies for the ills of sheet steel distribution were made by L. D. Mercer of the Central Alloy Steel Corporation to the Metal Branch of the National Hardware Association. These recommendations were submitted to the trade practice conference committee of the Metal Branch, which will ascertain the attitude of the sheet mills toward putting them into effect. The "14 points" are:

That all mills divorce themselves from all subsidiary jobbing connections owned by them, but masquerading under some other name.

That all mills desist at once from the practice of pool car shipments at the carload price.

That all mill membership in the organization be cancelled at once.

That who or what is a jobber be defined and an authorized list of all who can so qualify be prepared for general distribution.

That all so listed be formed into an organization to supplant the present metal branch.

That a committee of jobbers be named from this new organization to confer with a similar committee from the mill organization, the two committees to confer from time to time on matters under dispute or on suggestions and that the recommendations

from this joint committee shall be binding on both organizations.

That all jobbers pledge themselves to restrict themselves to their respective territories.

That a copyright brand be selected by the association and that all interested mills shall be licensed to sell such brand at a uniform market price.

That jobbers pledge themselves never to buy any sheets that do not bear their own copyright brand.

That a committee of the metal branch or a joint committee of the jobbers be empowered to establish resale prices on products covered by the brand named and that said price be enforced.

That a spirit of cooperation be adopted by jobbers and manufacturers.

That a buyer who handles one carload within a given time is not entitled to the same consideration in price as one who can handle 10 times as much in the same time.

That the jobber be assigned the task of handling this semi-occasional carload business, together with less than carload business from stock and that the jobber make no effort to handle the tonnage business.

On the other hand, that mills stay away from the one carload or less buyer and devote themselves exclusively to the tonnage business.

O. Carfer, Republic Metalware Co., Buffalo. He said that the greatest service that could be performed by the industry would be a campaign for the education of the sheet metal worker to make him a better salesman. Much could also be accomplished if the sheet metal workers would make their shops more attractive.

More general adherence from year to year in the simplification program as applied to sheet metal products was shown in figures contained in a report submitted by H. R. Colwell, Division of Simplified Practice, Department of Commerce. Mr. Colwell also submitted the report of the terne plate simplification board of review. This embodies suggestions from the manufacturers for the elimination of coatings in some weights, but the committee thought it advisable not to make any further eliminations for another year. The report was accepted by vote.

Galvanized roofing in gages lighter than No. 29 has been eliminated in some parts of the country and in lighter than No. 28 gage in other sections, according to a letter read from W. L. Latta, Wheeling Steel Corporation, chairman of the sheet steel simplification board of review.

Terne Plate Demands Are Reported To Be Shrinking

The distribution of terne plate was discussed by T. E. Millsop, Weirton Steel Co., who said that there had been some shrinking in the demand for this product and that the only way to increase distribution was by stirring up sales activities. R. H. Lyon said one reason for the shrinking demand was the small profits. H. E. Nickerson, Congdon & Carpenter Co., Providence, R. I., emphasized the importance of personal contact to help sell products. His company, he said, had devoted considerable attention to pushing roofing plate, which had resulted in an increase in sales.

That there is a too narrow margin of profit in the distribution of eaves trough and conductor pipe was the complaint made by R. L. McHale, David Lupton's Sons Co., Philadelphia, in discussing the distribution of that product. The great evil of the eaves trough and conductor pipe business, according to Mr. Lyon, is the practice which he said is followed by some manufacturers, who, in taking an order for these products in both special and common sheets, will hold to the established re-sale price for the former but will sell the common sheet products at cost.

Chrome Plating of Copper Broadening Consuming Field

That consumption of copper increased 17 per cent last year over 1927 was brought out in a discussion of the distribution of sheet copper by G. F. Stanton, Baltimore Copper Mills. He attributed the recent price advance to this increase and to the depletion of stocks. The speaker urged jobbers to stock brass pipe and carry

more complete stocks of other brass and copper products. The electrolytic plating of tin on copper was started a month ago, he said, and copper is now being chrome plated, these developments broadening the consuming field. Increased demand has developed for lead-coated copper.

Four new members of the metal committee were elected for three

years. They are: W. H. Bowe, Her-
rick & Co., Boston; Robert H. Lyon,
Lyon, Conklin & Co., Baltimore; R. V.
Truesdale, Hibbard, Spencer, Bartlett
& Co., Chicago; Carl Roth, Braden
Mfg. Co., Terre Haute, Ind. G. L.
McKewen, Farwell, Ozmun, Kirk &
Co., St. Paul, Minn., was elected for
two years to replace F. B. Platt of
that company, who resigned.

Steel Treaters Hold Regional Meeting

Four Eastern Chapters Spend Day at Bethlehem Steel Co. Plant—Hear Technical Papers

THE first annual joint meeting of the New York, New Jersey, Philadelphia and Lehigh Valley chapters of the American Society for Steel Treating was held on Friday, May 10, in Bethlehem, Pa. This meeting proved to be the most successful one ever held by a group of local chapters of the society.

More than 400 members from the three outlying chapters, New York, New Jersey and Philadelphia, drove to Bethlehem in large overland buses, arriving at Drown Hall, Lehigh University, at 10 a. m. Here Walter L. Trumbauer, chairman of the Lehigh Valley chapter, introduced Dr. Charles R. Richards, president of Lehigh University, who welcomed the members to Bethlehem. Afterward Mr. Trumbauer introduced Bradley Stoughton, professor of metallurgy, who acted as chairman of the technical session.

Two papers were scheduled, the first, "Manufacture of Alloy Steels," by A. D. Shankland, superintendent, open-hearth department, Bethlehem Steel Co., and the second, "Manufacture of Fine Steels," by J. H. Parker, vice-president of the Carpenter Steel Co., Reading, Pa. Each of these papers created considerable discussion and brought out many interesting points in regard to the manufacture of both structural and tool steels. Following adjournment, the group assembled for a complimentary luncheon in the main dining room of the Bethlehem Steel Co.

At 2.30 p. m. the group was escorted through the drop forge plant, which is adjacent to the main office building. Here they saw the drop forging of various materials, for use in the automotive and other fields, on hammers varying in size from 400 to 8000 lb. Following the inspection of this department, the delegation boarded a five-car train and were transported to the Saucon plant, where they saw the rolling of I-beams, and thence through the 30-acre storage yards, containing thousands of tons of I-beams, H-columns and channels assembled for shipment.

On the way to the forging specialties department, the group viewed two large tilting open-hearth furnaces, each having a capacity of 200 tons. Arriving at the forging specialties department, they saw the manufacture

of many different types of structural material used in ordnance, automotive, aircraft and other industries. From here the group entrained and were taken to the press forging department, where forgings are hydraulically pressed or hammered. The products of the press forge department include the largest and heaviest forgings that can be produced, such as crankshafts for the largest engines, large-diameter rings, reaction chambers and straight shaftings of large diameter. The equipment of this department includes steam hammers and hydraulic presses up to 14,000 tons capacity.

Passing alongside numerous blast furnaces, the group went to the tool steel finishing department. Here they observed the forging of tool steels and the various hardening operations. The delegation next visited No. 3 open-hearth to see the pouring of a heat of steel and then continued through the merchant mill department, where alloy steels are rolled into bar products and where specialties for automotive and airplane industries are manufactured.

Following the trip the group went to the dining hall of the Masonic Temple, where 600 members and guests of the four chapters had dinner. At the speakers' table, with the officers of the four chapters, were seated Dr. Zay Jeffries, president; W. H. Eisenman, secretary, and J. M. Watson, treasurer of the national society. The dinner program was interspersed with music, and, following the dinner, Mr. Trumbauer introduced the speakers of the evening. W. H. Eisenman first told of the work of the national society from the viewpoint of the secretary, and J. M. Watson gave a survey of its financial history. Dr. Jeffries reviewed the broader aspects of the work of the national organization.

Following these three speakers, S. H. Buck, secretary of the Bethlehem Chamber of Commerce, was introduced as the principal speaker of the evening.

The group conference surpassed in attendance several of the semi-annual meetings of the society sponsored by the national organization. A special vote of appreciation was given to the Bethlehem Steel Co. and its officers and employees for their courtesy.

A New Urge to Real Cost-Finding

Method of Arriving at Overhead and Profit on Machine-Hour Basis—Need of Adequate Background for Soliciting Business

BY LOUIS G. GOETZ*

NO one would think of conducting an industrial gear plant without financial records, and yet it is certain that some are without adequate cost data on which to base decisions. Information contained in adequate cost records is important because it is essential for accurate estimates, for setting sales prices, for determining what business shall be bid on, and what shall be passed by, and finally, for intelligent control of expense.

Competition is now so keen that it has become necessary to exert constant sales pressure and to scale profits to the vanishing point, to obtain every cent's worth of business. This means that each executive in charge of operations must know where he stands when bids are made on industrial work. He must cease guessing and deal with facts. If a price must be cut to obtain certain business, he ought to know what element of his cost he expects to reduce to meet the cut, and how much he expects to reduce it; for, if he wishes to be conservative, he cannot cut until he knows what he can afford to cut, and how much.

He must know whether the work on which he is asked to bid is such that his plant is suited to handle it efficiently. Finally, he may be compelled to decide whether it is not more profitable to lose the business than to get it at any price. The part of his organization which must present facts to give the true answer to such questions, so that an intelligent decision can be made, is the cost department.

Three Main Elements of Costs

Elements entering into the manufacturing cost of any gear are three:

1. Raw material,
2. Direct labor,
3. Indirect expense, variously known as "burden" or "overhead."

Raw material must not be confused with indirect or expense materials which are used incident to the manufacturing processes, which disappear during these processes, and which cannot be identified as part of the finished product. Materials of this class are a part of overhead. Cutters, which

may be required for gears with special teeth, are the only exception. Such tools are usually special for a particular job, and their cost is ordinarily treated as an item separate from and additional to the three elements mentioned.

In most cases raw material is bought outright like any other merchandise. The segregation of its invoice cost, plus transportation and handling charges, offers no difficult problem, and a unit value can be obtained for any gear with comparative ease.

Because obtaining raw material is a merchandising proposition, and because most plants are on an equal footing in respect to it, it is not likely that two plants bidding for the same business will be far apart in their estimates on this element. Nor is any reasonably accurate method of recording invoice prices, freight and handling charges likely to result in much error in arriving at a unit cost of this element for each gear.

Direct Labor Easily Accounted For

Because direct labor, like raw material, can be specifically identified as applying to a certain gear or a number of like gears, processed in one group or on a particular order, it is comparatively easy to segregate this element of cost.

If any sort of production records are available to record the number of pieces completed, a dependable unit cost of direct labor can be obtained without difficulty. Because of these facts, bids made on the same work by plants similarly equipped are not liable to vary greatly in their estimates of direct labor, except as differing wages may cause variation.

But when plants unequally equipped enter into competition, bids may vary greatly on the same work in respect to this element. In such a case, the plant whose estimate is based on complete cost records of actual performance has a distinct advantage.

Overhead Costs Are the Bugbear

But when the effort is made to segregate and apply "indirect" or overhead expense, divergence of both method and resultant figures ensues. This problem of application of overhead to either estimated or actual cost of a manufactured product, such as industrial gears, has long been a hard

nut for managers to crack. This is especially true in cases where cost records are inadequate or lacking, and it is natural, because of the complex composition this element presents and its indirect relation to the product.

Manufacturing or factory overhead, also called "indirect expense," may be defined as that expense which is incurred in maintaining and operating the plant, but which is not directly applicable to the product and which cannot be identified in, nor segregated to, any one unit of product. The following are some of the expenses of which it is composed:

- Shop supervision
- Salaries of factory clerks
- Experimental expense
- Non-productive factory labor
- Repairs to factory buildings and equipment
- Standard cutting tools
- Shop supplies
- Light
- Heat
- Power
- Water
- Liability insurance
- Depreciation on buildings and equipment
- Insurance on buildings and equipment
- Real estate and personal taxes

How shall such diverse expenses which compose one of the three essential elements be applied equitably to the cost of industrial gears, where the diameter range is from an inch or fraction to many feet, and the weight from an ounce or less to several thousand pounds? How can assurance be had that each kind of such diverse product is going to bear its proper share of it, and how shall the executive know whether enough is being applied to write into his costs the whole amount that is incurred?

Answers to these questions have been found, but they have been attained through long and tedious development.

Proportioning the Overhead Spread

The most advanced knowledge concerning the nature of factory overhead expenses, and their relation to the cost of a specialized (or you might say custom-built) product such as industrial gears, makes a self-evident fact of this principle; that overhead cost should be applied to the cost of the product in the same proportion, to the total overhead of the departments

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doing the work, which the time consumed in processing the product bears to the total available productive time of the departments in which the processing is done. This principle is fundamental, and any method of applying overhead which disregards it does not result in true and accurate costs. This principle may be formulated as an equation:

$$(x) \text{ Overhead to be applied} = \frac{\text{Total overhead}}{\text{Processing time}} \times \frac{\text{Total available time}}{\text{Solving for (x) we have Overhead to be applied} = \frac{\text{Total overhead} \times \text{Processing time}}{\text{Total available time}}}$$

The process by which this is applied is known as the "machine-hour" method.

To apply factory overhead on a machine-hour basis, it becomes necessary to break down the items of plant overhead, not merely by departments, but by individual machines or groups of machines within each department. It is necessary also to calculate the total number of hours over a given period which each machine or group should be used, to operate the plant at normally profitable capacity.

By dividing this number of hours for each machine (or group) into the total overhead applicable to the machine (or group) for the same given period, there is obtained a factor which represents the "normal" amount of overhead that should be applied to factory costs for each hour of work which each respective machine performs on any product. The amount of factory overhead to be applied to costs for the use of any machine is obtained by multiplying the hours that machine is used by its normal machine-hour rate.

Rates Should Be Stable

As stated, the rate for each machine is based on "normal" operation of the plant. Once such rates are established by the use of dependable information, no change should be made until every element indicating change has been analyzed. In particular, no change should be made either during times of slack business or when work is plentiful, because it is only when a complete cycle of plant operations is compassed that a true picture with respect to the overhead element of cost is obtained.

Because these rates are based on a normal scale of plant operation, and because they apply factory overhead to costs on such a basis, they present to the executive a standard by which he can judge the scale on which his plant is operating. Their use also results in costs at which he must expect his sales department to get business. This is another reason why, once established, they should not be changed unless further study shows that there has been a decided change in conditions since they were established, and that they no longer reflect the substantial facts.

We have now seen that direct ma-

terial, direct labor and normal overhead, applied on the basis of machine-hours consumed in processing operations, constitute the elements of factory costs entering into the processing of industrial gears. But what about the other expenses of the business, as sales and general administrative overhead?

It is plain these expenses bear no such relation to the cost of individual items as does factory overhead, because they are more general in their nature. It is neither feasible nor necessary to make such direct application of them to the product, because the proportion is usually small, and there is no basis on which such application can be made. Therefore, it is customary, and a widely accepted procedure, to add to the factory cost a flat percentage to cover these elements.

This percentage is based on the relation of the total of this class of expenses to either the total factory cost over a given period, or to a given volume of sales. The resulting figure after the addition of this percentage is selling cost. It contains all the elements of the total cost of making and selling the article. To this total cost the profit must still be added to arrive at the selling price or figure to quote.

Using Machine-Hours for Overhead

As the sales department of a gear plant is selling available manufacturing capacity, this should be reflected in the costs in an amount proportionate to the usage of this capacity in processing the goods. The means by which this may be accomplished is to use a selling and administrative expense rate per machine-hour.

This method of application is commendable for its simplicity and the expedition which it gives to estimating. Before it can be used there must first be developed a series of factors. Except for material, and profit thereon, these factors each combine in one figure for each machine all the elements of selling price; direct labor rate per hour, machine-hour rate of overhead, selling and administrative rate of overhead per machine-hour and profit.

For instance, with a direct labor rate of 55c. an hour, a machine-hour rate of overhead of \$1.05, a selling and administrative overhead rate of 30c. per machine-hour and profit of 30c. per machine-hour, the factor would be for that particular machine:

Labor	\$0.55
Machine-hour rate of overhead	1.05
Selling and administrative rate of overhead	0.30
Profit per machine-hour	0.30
Total rate per machine-hour	\$2.20

To estimate by this method, the hours required on each machine are multiplied by the respective factors, and to the sum of these products is added the cost of material plus a profit thereon. The resulting sum is the sale price.

Taking, as a simple example, a gear

requiring the use of the above machine for 3 hr., the material which costs, including profit, \$2.60, the estimate would be as follows:

Material including profit thereon	\$2.60
3 hr. use of machine at \$2.20 an hour	6.60

Selling price to quote.....\$9.20

This formula in effect means that each hour of machine time is calculated to produce its own amount of selling price value, of which a certain known part is profit, and it produces selling prices in which the overhead elements are proportioned to the manufacturing effort.

Of course, no invariable percentage of profit can ever be maintained and it will sometimes be necessary to take less profit than that estimated, to get the business. But when the absolute limit is known to which a quotation can be cut before the cost line is crossed, the executive who is answerable to his board of directors for results has a firm foundation on which to stand. He knows exactly how far he dares go, and he can base his decisions on facts and not guesses.

Upward Trend in Building Seen by S. W. Straus & Co.

In their monthly survey on building construction, S. W. Straus & Co., New York, report that building permits issued or plans filed in 590 leading cities and towns in 48 States indicate an upward trend in building activities. April permits granted in the 590 cities totaled \$538,446,781, compared with \$347,949,526 in April, 1928. April permits also showed a gain over those of March this year, which totaled \$408,667,003. The normal seasonal variation between the two months, the report states, is a 1 per cent decline.

Of the 25 cities which led the country in plans or permits in April, 16 showed gains over the preceding month and the preceding year and 17 reported larger volumes this April than for April, 1927. Chicago showed a loss this year from both April, 1928, and April, 1927. Among the cities in which there was a definite upward trend are Baltimore, Washington, Detroit, Minneapolis, Milwaukee, Houston, San Antonio, Seattle, Hartford, Birmingham, Oklahoma City and Tulsa. There has been a marked falling off in such activities in the suburban areas of the principal cities of the country.

Seneca Wire & Mfg. Co., Fostoria, Ohio, has taken over the plant of Wheelon Wire Co., West Brookfield, Mass., and will operate it as the West Brookfield plant of the Seneca company. George Mathews, who has been superintendent of the Driscoll Wire Co., Shelton, Conn., will be manager of the plant, which will continue the manufacture of a complete line of high and low carbon wires. L. E. Kinn is president of Seneca Wire & Mfg. Co. and A. J. Welly is secretary.

Gear Manufacturers in Cleveland

Thirteenth Annual Meeting Featured by Progress in Standardization—Tooth Stresses Shown by "Movies"

STANDARD design and other technical practices, discussed last week at the thirteenth annual convention of the American Gear Manufacturers' Association, at the Statler Hotel, Cleveland, formed a large feature of the meeting. Committee reports and progress reports brought each of several items to a head, either with a recommended practice or with a tentative practice for criticism, suggestion and amendment. This session was under the chairmanship of B. F. Waterman, engineer, Brown & Sharpe Mfg. Co., Providence, and chairman of the association's general standardization committee.

A strong plea for adequate and accurate cost data was made in a paper, "Knowing Your Costs," by Louis G. Goetz, manager of the factory system department of Nau, Taylor & Swearingen Co., Cleveland. This paper is abstracted in this issue. Another outstanding contribution was a paper by A. H. Candee of the Gleason Works, Rochester, on "Gear Geometry." The paper "Load and Stress Cycles in Gear Teeth" is abstracted below.

Because of the amount of ground to be covered in the 2½-day meeting, an evening session was held Thursday, with the banquet following on Friday evening.

Stresses in Gear Teeth Simultaneously in Action

AN outstanding paper was on "Load and Stress Cycles in Gear Teeth," by R. V. Band and R. E. Petersen, research department, Westinghouse Electric & Mfg. Co., East Pittsburgh. The paper presents a method of solving the load division problem analytically, and relates to general stress relations, determined by photo-elastic tests of gears in which the number of teeth carrying the load varies. An interesting feature of the presentation were polarized light motion pictures showing the stress distribution for gears having various numbers of teeth.

It was pointed out by the authors that many designers incorrectly assume that, when there is contact at more than one pair of teeth, the two or more pairs in contact divide the load equally. However, owing to the elasticity of the teeth, the load distribution is non-uniform, and each pair of teeth passes through a regular loading cycle. In the first part of the article an expression was evolved connecting the load on a pair of teeth with the distance along the line of action from the point where contact begins to the momentary point of contact.

It was shown that, in pairs of gears in which two pairs of teeth are in contact part of the time and a single pair during the rest of the time, there is a sudden very large increase in load on one pair when the other pair breaks contact. This sudden increase in the load on a pair of teeth occurs just before contact on them reaches the pitch point.

On the other hand, if the number of teeth in the gears is sufficiently large so that there is contact simultaneously at three pairs of teeth, for even a very small part of the time, then the load on any pair of teeth de-

creases as contact on it approaches the pitch point. Thus the maximum load on the teeth is greatly decreased if the "number of teeth in contact" or the "contact ratio" is increased from slightly below to slightly above 2.

The authors applied the results of their analysis to three pairs of ten-pitch gears with a 1:1 ratio, with 20, 35 and 75 teeth respectively, for which the "contact ratios" were 1.68, 2.08 and 2.32.

The photo-elastic method for the determination of mechanical stresses was applied—probably for the first time—to gears in motion, the results being recorded on moving picture film. As is usual with the photo-elastic method, gears of celluloid were used, and were revolved under load at 8 r.p.m., while the polarized light that produces color effects when passing through transparent bodies under mechanical stress was sent through them.

It was pointed out by Mr. Band that the most intense stresses which occur in gear teeth are the compression stresses at the point or line of contact. The contact point appeared in the pictures as a black spot which traveled along the line of action. This spot was surrounded by various-colored bands denoting different degrees of stress. With the pair of gears with small "contact ratio" the sudden increase in stress as one pair of teeth broke contact was plainly visible by a sudden expansion of the various bands, showing that the same stresses now occurred at greater distances from the origin, the point of contact.

The stresses were determined photo-elastically, because the problem involves several factors which cannot be determined analytically. The scope of the photo-elastic tests was to show the effect of contact ratio on the magnitude of the stresses. The model

gears, made of camphor-celluloid of 0.2385 in. thickness, and the apparatus were described and illustrated by slides.

The analytical solution of the load division problem enables the gear designer to compute the load cycle for multiple contact. Ultimately, however, the concern is with the magnitude of the stresses in the gears, rather than with the forces.

These moving pictures, which gave a very good idea of stress conditions in a gear tooth during the period of contact, were much appreciated by the gear men who saw them.

General Standardization Committee Report

THE Bevel Gear Committee is offering a revised nomenclature, a revision of one adopted a year ago but which was held up because of certain difficulties which prevented its being printed. This work, of course, is being done jointly by the Bevel Gear Committee and the Nomenclature Committee.

The Nomenclature Committee is submitting a progress report for involute, external, helical and herringbone gear nomenclature, the object of which is to have a thorough discussion on the various terms and definitions.

The Worm Gear Committee is offering a proposal for worm gear nomenclature, being done in connection with the Nomenclature Committee. This is made up in the same form as previous practices, and is based on them, no divergence being made which can be avoided. This is not complete because the formula is not included.

The Metallurgical Committee is offering for acceptance a recommendation of material for forged and rolled

alloy steel for gears and a revision of the present practice for forged and rolled carbon steel.

The Spur Gear Committee at the last meeting made a report and presented tables for quickly finding the diameters and necessary dimensions of metallic pinions for various horsepower, etc.

Report of Standards Committee

PROPOSED standards sent out within the last several months by the American Standards Association include a proposed American standard spur gear tooth form, 14½-deg., full-depth involute system and a 20-deg., full-depth involute system, and a proposed American recommended practice for the inspection of gears, including worms, hobs and cutters.

The Materials Committee has in proof form a proposed American recommended practice for gear materials and blanks of alloy steel, cast steel, forged and rolled carbon steel, bronze and brass.

The Bevel Gear Committee has in circulation a recommended practice for bevel-gear adjustment, which may be presented generally.

The Herringbone Gear Committee's work hinges upon the work of the committee of the American Standards Association, representing perhaps the largest manufacturers of these gears.

Nomenclature

A PROGRESS report for involute external helical and herringbone gear nomenclature was presented by the nomenclature committee, which is headed by D. T. Hamilton, Fellows Gear Shaper Co., Springfield, Vt., for the purpose of opening discussion on several of the 69 terms used in specifying and calculating. Terms having a dimensional value have been symbolized. After making corrections and adding formulæ and sketches, the committee will present this nomenclature at the next meeting.

Worm gear nomenclature was submitted for discussion by W. H. Himes, chairman of the worm gear committee. A few changes were suggested, and it is planned to present this nomenclature at the next meeting as a suggested standard for future design. Cooperative effort in making tests which might furnish reliable data on the safe loading of worm gears was discussed.

Report of Metallurgical Committee

On March 1 and 2 subcommittee VIII on gear materials, under the sectional committee on gears of the American Standards Association, met in Pittsburgh and considered four sections of the A. G. M. A. metallurgical work which is being submitted to the A. S. A. This has since been sent out in printed form for criticism by the A. S. A. under number B 6 f. Copies can be obtained from C. E. Le Page of the A. S. M. E., who is secretary of the sectional committee (29 West Thirty-ninth Street, New York).

The steel castings specifications

sheet of the A. G. M. A. was dated October, 1925. An amendment was passed in October, 1926, but the whole was not reprinted; the present form merely combines these, without material change.

The Non-Ferrous specifications of the A. G. M. A. are being sent out by the A. S. A. in practically the present form without change, except insertion of A. S. T. M. numbers where they apply.

Forged and rolled carbon steel specification has been amended in several particulars, but not seriously changed. These changes are covered by the mimeographed sheets presented at this meeting. When approved, this will be incorporated in regular A. G. M. A. standard forms.

The forged and rolled alloy steel specification developed by the A. G. M. A. has been approved by subcommittee VIII, with four changes, which have been concurred in by the A. G. M. A. metallurgical committee. This has now been passed on to the A. S. A., has been printed and issued for preliminary consideration. These four changes are:

Par. 6, line 4—Change "quarter" to "eighth" as the amount of surface metal to be discarded when sampling.

Par. 7—Add an extra sentence at end: "When sampling the surface material for a depth of at least ¼ inch shall be discarded."

Par 9(b) change to read "the identification marks specified on the order to be stamped on gear blanks shall be placed on the web, or in such position that they will not be obliterated in machining."

Table 1: Add another steel, No. 4615, at the bottom: C, 0.10 to 0.20 per cent; Mn, 0.30 to 0.60 per cent; S, 0.045 per cent maximum; P, 0.04 per cent maximum; Ni, 1.5 to 2.0 per cent; and molybdenum, 0.20 to 0.30 per cent.

Alloy Steel Causes Discussion

There was considerable discussion on the report of Chester B. Hamilton for the Metallurgical Committee, which proposed a new recommended practice for alloy steels and amended recommended practices for other materials. In written discussion by O. S. White, chief engineer, Warner Gear Co., it was pointed out that S. A. E. steels Nos. 2345 and 5150 are being used for automotive gears, and should be included in the list.

Mr. White also objected to the carbon range of 10 points on the various steels. The chief objection to such a wide carbon range came from Perry L. Fenney of the Muncie Products Corporation, Muncie, Ind., who said that his firm had been specifying a 5-point carbon range for the last seven or eight years. He considered the proposed specifications behind the times.

C. B. Hamilton agreed that a closer limit on the carbon range was desirable on the case hardening steels but unnecessary in the higher carbon steels. It was brought out that the S. A. E. now has under consideration proposals to narrow the carbon

ranges of its steels, and in view of this fact it was decided to change the status of the report to that of a progress report, as which it was adopted.

A report for the Spur Gear Committee was made by Mr. Burnham. It dealt with the horsepower tables on which the committee is working and was accepted as a progress report.

H. E. Eberhardt reported for the Tooth Form Committee. It has been suggested to extend the 14½-deg. and 20-deg. full-depth involute systems which have been worked up by the committee down to 8 and 9 teeth, but at a meeting of the committee on Friday it was decided to limit both systems to a minimum of 12 teeth.

Membership Items

One new company, the National Foundry Co., Erie, Pa., was admitted to membership.

Greetings were telegraphed to H. E. Eberhardt, president of the Newark Gear Cutting Machine Co., Newark, N. J., and Frank Burgess, president of the Boston Gear Works, Norfolk Downs, Mass., both of whom were absent because of serious illness. Telegrams of like character were sent also to Charles E. Crofoot, Crofoot Gear Corporation, South Easton, Mass., and W. H. Diefendorf, Diefendorf Gear Corporation, Syracuse, N. Y.

F. C. Clough was elected as an associate representative of the Federal Gear Co., Cleveland, a member company.

At the annual banquet, Honorary President F. W. Sinram acted as toastmaster. The chief speaker at the banquet was Carl Schuler, law director of Cleveland. Addresses were made also by President A. F. Cooke and George L. Markland, Jr.

National Twist Drill Buys Into Winter Brothers Co.

The National Twist Drill & Tool Co., Detroit, manufacturer of twist drills, milling cutters, reamers, hobs, special tools, etc., has acquired a substantial interest in the Winter Brothers Co., Wrentham, Mass., manufacturer of taps and dies. No changes are contemplated in the Winter Brothers Co.'s organization and the executives, John Winter, Murray Winter, and Charles Winter, will remain in the same capacities as heretofore.

Ohio Foundrymen to Meet

A Cleveland district group meeting of the Ohio Foundries Association, Inc., will be held at the Statler Hotel, Cleveland, May 27. Following a dinner a film entitled "The Jewels of Industry" will be presented. This relates to the making of abrasives and grinding and snagging operations.

Chicago offices of the Foote Brothers Gear & Machine Co. have been moved from 215 North Curtis Street to 111 North Canal Street.

World Economic Outlook Favorable

Stabilized Currencies Will Speed Up International Trade, Say Conference Board Speakers—No Cause for Alarm in Export Merchandise Balance

INTERNATIONAL trade is entering an era of more rapid growth, following the stabilization of currency in most of the leading nations. Our persistent export balance of merchandise is no cause for alarm, but merely represents good business, on a *quid pro quo* basis. Isolation is passing, with the trend very definitely toward integration into one social organism.

These conclusions were voiced by various speakers at the thirteenth annual meeting of the National Industrial Conference Board at Hotel Astor, New York, May 16, and indicated to what a marked degree the attention of American business men has been drawn to the possibilities of foreign trade. The economic position of this country can no longer be appraised on the basis of data gathered within its boundaries. This fact the Conference Board has recognized by arranging for the collection of information regarding industrial and economic developments abroad.

The far-reaching importance of currency stabilization was emphasized by Fred I. Kent, director, Bankers Trust Co., New York, who spoke in the afternoon session, and by Hon. Alanson B. Houghton, recently American ambassador at the Court of St. James's, who made the principal address at the annual dinner.

Europe Has Shown Marked Recovery

Economically, the countries of Europe have made great strides during the last seven or eight years in their recovery from the World War, and the economic outlook on the whole is very encouraging, said Mr. Houghton.

"Great Britain, France, Germany and Italy all are making economic progress. There is no unemployment in France and no serious industrial unemployment in Germany. Great Britain is still struggling with an unemployment problem in certain industries. But, roughly nine-tenths of the industry of Great Britain is sound, well equipped and highly productive.

"Italy is still in the midst of a great experiment, the ultimate outcome of which is not yet predictable, although the methods used in Italy thus far have been effective. Germany, although carrying a great burden, industrially cannot be held back unless some untoward results should arise out of the reparations problems. The visible effects of the war upon the country and upon the psychology of the people have disap-

peared to such an extent that a visitor who had not seen Germany during the last few years would not now recognize the country."

Political exigencies and traditions still present problems the solution of which no man can foresee, he declared. In regard to Anglo-American relations there is no reason to doubt that they will continue friendly, and the activities of the League of Nations constitute a wholesome influence by creating a public opinion of Europe and focusing attention on the common problems of nations. There is a new approach to the control of war, he stated. Rather than seek to determine who is the aggressor, it is proposed first to isolate the war area, on the same principle that the first logical step in case of a fire is to put it out, deferring investigation of the cause until later.

Mr. Houghton is emphatically opposed to any change in the present attitude of the United States toward the Soviet Government. "Personally, any change in the situation, or a change in the relations between the United States and the Russian Government, seems to me unlikely so long as the present generation is in control of affairs in Russia," he said.

Our Exports on Sound Basis

"There are no grounds for believing that the United States has as yet become a mature creditor nation," said Virgil Jordan, chief economist of the Conference Board, in the afternoon session, discussing "American Industry in the New Economic World Currents." "In fact, if we leave out the illusory and barren debts arising out of the war and count only our net investment of reproductive capital, it may fairly be said that the net creditor position of the United States today is about what it would have been if there had been no war and if the tendencies evident in the 15 years from the beginning of the century to 1914 had continued.

"The net creditor position of this country has tended since 1922 to settle down to a relatively stable and normal basis. We have merely been reinvesting the sums due us in interest, dividends and principal repayment on our outstanding credits.

Outgoing Long-Term Loans Offset by Incoming Short-Term Funds

"Excess outflows of investment capital from year to year have been offset by net imports of short-term capital, and in some years these have even exceeded the outgoing balances of investment funds. In short,

the country has merely permitted the long-term capital exports that took place during the war and early post-war years to reside permanently abroad, and the excess of new long-term capital investments has been cancelled by a varying inflow of short-term funds.

"As a nation we may have done some plunging during the war, under stress of exceptional circumstances, but we certainly have not been recklessly piling up stakes in foreign countries in the past seven years.

Foreign Trade on Quid Pro Quo Basis

"It is equally a delusion that in the years since 1922 we have been selling our goods abroad on the installment plan, sustaining our huge volume of exports on credit and preventing compensating imports of commodities by our foreign investments and our high tariff wall. The fact is, rather, that the persistent export balance of merchandise, which has amazed and alarmed us during these years, has been for the most part merely normal good business, on a *quid pro quo* basis. Enlarged or diminished from year to year by net gold movements, our excess of exports of goods has been offset or balanced fairly evenly by the excess of payments over receipts for services, particularly the pleasures that Americans are now forced to 'import,' or perhaps imbibe, abroad.

"In fact, in every year from 1921 to 1927 the actual balance of all tangible trade, lumping together merchandise, gold and services, was probably against us, and we have been importing more than we exported.

Federal Reserve System Commended

"These things do not mean that our present and prospective international financial position involves no problems at all for American industry and foreign trade in the future. Some of the factors in it have had a direct and vital influence on American business conditions in recent years, and are likely to have a still greater influence in later years. The rapid and unprecedented expansion of bank credit during the years since 1922, which has been the basis of the rise of security prices and the outburst of speculative fever and 'new era' psychology that worry so many people, is a direct result of the unbalanced international financial situation arising from the war, which brought us half the world's gold.

"The current controversy over the

policies of the Federal Reserve System is a direct reflection of our international financial position and lack of public understanding of its significance. The efforts of the Federal Reserve System, through cooperation with central banks abroad, to soften the shock to our industry, trade and finance of the sudden transition to an abnormal and largely unsound creditor position, to absorb and redistribute the gold flowing to us from our demoralized and bankrupt debtors, so as to prevent a disastrous dislocation of world prices and to aid in the restoration of world trade—these efforts have constituted one of the great contributions to international welfare."

American Isolation a Thing of the Past

Magnus W. Alexander, president of the Conference Board, in an address at the morning session, gave prominence to the thought that "by the aid of mechanical invention and its effect on the processes of production, communication and transportation, we have become interdependent to a degree which daily makes us realize more keenly that cooperation, between individuals or nations, is not only an important aid but a necessity to our well-being. Never have the peoples of the various nations, whether near to or far distant from each other, lived in greater actual propinquity than they do today. The United States, during the first hundred years of its existence, busily engaged in developing its own resources, peopling its vast territories and building lines of communication from coast to coast, lived a somewhat isolated existence. Indeed, its isolation became a tradition which, however, some time ago had already outlived the actual situation, at least so far as its economic position is concerned."

Economic necessity is forcing international cooperation; it inspired the Treaty of Locarno, the speaker said. "Economic necessity and cooperation are increasingly becoming the chief motivation in all international dealings, definitely disclosing a growing consciousness of the inherent unity of human society."

Election of Officers

The Conference Board reelected as chairman Charles Cheney, president, Cheney Brothers, South Manchester, Conn. Magnus W. Alexander continues as president and chief executive of the organization and Frederick P. Fish, Fish, Richardson & Neave, Boston, remains honorary chairman.

Fred I. Kent, director of the Bankers Trust Co., New York, was re-elected treasurer, and the following were made vice-chairmen: Irene du Pont, chairman finance committee, E. I. du Pont de Nemours & Co., Wilmington, Del. (re-elected); Herbert F. Perkins, first vice-president, International Harvester Co., Chicago (re-elected); Cornelius F. Kelley, presi-

dent, Anaconda Copper Mining Co., New York; Matthew S. Sloan, president, New York and Brooklyn Edison companies, New York.

The executive committee for the ensuing year will be composed of A. Farwell Bemis, chairman, Bemis Brothers Bag Co., Boston (re-elected);

John Henry Hammond, member of Brown Brothers & Co., New York; Howard Heinz, president, H. J. Heinz Co., Pittsburgh; R. C. Holmes, president, Texas Co., New York; Loyall A. Osborne, president, Westinghouse Electric International Co., New York, ex-officio as past chairman.

Quenching Steel Not at All Understood

It Will Sometime Be Carefully Controlled—Applications of General Laws Presented to Boston Steel Treaters

AT the May meeting of the Boston Chapter of the American Society for Steel Treating, Frank R. Palmer, assistant to the president, Carpenter Steel Co., Reading, Pa., delivered a very important address on "Quenching." A brief report of his address, which was declared by some present to have been inspiring, follows:

Quenching, according to Mr. Palmer, is the most important and the least understood factor in heat-treating operations. Everyone knows that internal stresses are produced by heating and quenching steel. These are generally regarded as harmful, and properly so; but the speaker's argument, throughout his address, was that they can be made helpful and not destructive. These stresses, in ordinary carbon tool steel, can amount to 400,000 lb. per sq. in., and he encouraged his hearers to think of the possibility of using these forces instead of being obliged to combat them. Mr. Palmer believes that some day quenching operations will be controlled as carefully as present heating operations and with far better results.

Four General Laws

The address centered in a discussion of what the lecturer called the four general laws regarding quenching:

1. Steel is stronger cold than hot.
2. Steel expands on heating and contracts while cooling.
3. Steel expands while hardening.
4. All steels have exactly the same elastic properties.

To illustrate the fourth law, which was not familiar to all of his listeners, Mr. Palmer displayed an ingenious apparatus showing that long, slender bars of steel can be loaded on the end with known weights and that bar iron and heat-treated high-speed tool steel give exactly the same deflections until the yield point is exceeded. In other words, they have the same elastic properties.

Working out carefully the relation of expansion in quenched steel and the internal stresses, Mr. Palmer showed that an expansion of 0.001 in. corresponds to 30,000 lb. internal stress. This he uses as a yardstick and he impressed all of his hearers with the fact that micrometer measurements can be used to measure the internal stresses in quenched steel.

Ideas of this nature were quite new to many of his listeners and they made a very good impression.

How the Laws Are Applied

Mr. Palmer then took up some applications of his theories and of the four laws mentioned above and considered the quenching of simple shapes, like cylinders, squares or rectangles. By using 30 per cent nickel steel, which has no critical point, he was able to determine the effect of the first two laws, then by extending this to tool steel he was able to measure the effect of passing through the critical point. He then took up simple cases of header dies for wood screws, quenched by means of a flush of water passing through the hole and not drawn. In this way the internal stresses produced tend to work against the stresses during use. That is, these stresses are helpful instead of destructive and the life of the dies is greatly increased. In order to take advantage of these theories, the quenching equipment will include flushing jets of different shapes and kinds and careful regulations of the speed of cooling.

An interesting discussion followed the address, during which Mr. Palmer referred his listeners to papers in the *Transactions* of the society, by H. J. French and his associates, on quenching.

Preceding Mr. Palmer's lecture, a film was presented, showing the methods of the Fagersta Co., Sweden, of mining ore at the famous Dannemora mine; the making of wrought iron, of crucible, Bessemer, open-hearth, electric steel; of rolling operations and of inspection, etc. The film was loaned through the courtesy of A. L. Achorn, Boston representative of the Fagersta Co.

Spiegeleisen Imports Large This Year

Imports of spiegeleisen thus far this year have been very large. According to official data, 5116 gross tons had been received up to April 1. This is at the rate of 1705 tons per month and compares with 435 tons per month in 1928 and with 621 tons each month in 1927. The valuation of the 5116 tons received this year is put at \$143,728.

Metal Tariff Schedule Up This Week

House of Representatives Expected to Take Early Action—
Manganese Producers Renew Fight for Increased Duty

WASHINGTON, May 21.—Consideration of the metal schedule of the tariff bill is expected to be taken up in the House of Representatives the latter part of the present week. Changes that may be made, it is believed, will relate more to phraseology than to rates. Efforts, however, are under way to have rate changes made.

Outstanding in this direction is the activity of the American Manganese Producers' Association, which is continuing its fight to have the duty on manganese ore increased to 1½c. a lb. of contained manganese. The Ways and Means Committee approved the action of its subcommittee on metals which left the rate unchanged at 1c. The drive to have the manganese rate increased has taken the form of organization of Republican members of the House from manganese producing States, who, at a night session of the Ways and Means Committee on May 16 and at its morning session the following day, presented a renewed appeal for a ½c. increase.

Representative Bacharach Explains Metal Schedule

In explaining the metal schedule of the bill to the House, Representative Bacharach, Republican, chairman of the subcommittee which has charge of the schedule, made the interesting statement that in preparing it the subcommittee tried to follow the "Garner" yardstick, Representative Garner, Democrat, of Texas, being minority leader of the House and ranking minority member of the Ways and Means Committee. This "yardstick," according to Representative Bacharach, required that imports had to amount to more than 5 per cent of domestic production.

The iron and steel industry, he stated, has developed throughout the history of the nation and is now considered, as a whole, highly efficient and on a sound economic basis. Although profits have been low during recent years, it was pointed out, they show a tendency to increase.

"There are, however, some maladjustments of classification and rates, and since 1922 there have been advances in metallurgical practice and changes in economic conditions of the industry which prompted careful consideration from a tariff standpoint," Representative Bacharach said. "The advantages which European producers of iron and steel enjoy as a result of low costs for labor and transportation have been accentuated since the war by the mod-

ernization of many old plants, the building of new plants, the general adoption of more efficient methods of operation, and the organization of many producing units into cartels. A few domestic iron and steel products meet severe competition, particularly along the seaboard, and it has developed that some rates are not in line with the general rate structure applying to iron and steel products."

Consequently, he said, the adjustments in the schedule were made with a view toward mitigating existing inequalities in competition without materially affecting the general level of rates imposed by the schedule.

Rate Increases on Metal Products Are Small in Amount

Representative Bacharach said that the metal schedule of the existing tariff law contains 100 paragraphs and 291 brackets or separate rates of duty and that witnesses had appeared before the Ways and Means Committee and asked for changes in nearly 70 paragraphs. The committee, however, it was said, had made changes in bracketing, phraseology and rates, so that the schedule in the bill contains 99 paragraphs and 340 rates. The rate changes, it was declared, affect 32 paragraphs, while 20 per cent of the total number of rates in the bill represent changes in amounts of duty. There are three decreases in rates, Representative Bacharach said, and most of the increases affect products of minor importance and are small in amount.

During the period 1925 to 1927 imports of the metal group were about 9 per cent by value of the total imports into the United States," Representative Bacharach explained. "They amounted to about \$370,000,000 per year. Of this amount about 64 per cent, or \$237,000,000, was admitted free of duty. These non-dutiable metal commodities consisted to the extent of about 95 per cent of ores and crude metals of tin, copper and precious metals. The dutiable metal commodities, valued at \$133,000,000 a year, likewise constituted about 9 per cent of the total dutiable imports of all kinds.

"The rates of duty in schedule 3 are not excessive as compared with other schedules. The equivalent ad valorem rate on all dutiable metal products was 34.25 per cent, as compared with a rate of 38.57 per cent for dutiable articles of all kinds during the same period.

"Although striking advances have been made in manufacturing methods and in technology, and a considerable

number of new products have appeared, comprehensive revision was found to be unnecessary. For example, the scope of the phraseology provided in the Act of 1922 (the existing law) on alloys was substantially broadened on account of the many new developments and the increasing importance of such products.

"Every effort was made to clarify the intent of the Act by giving specific classification to many products not heretofore mentioned, and particularly to those which have been the subject of litigation and have been classified by court of Treasury decisions."

In explaining the incorporation in the bill, of the proclaimed duty of \$1.125 per gross ton on iron in pigs, Representative Bacharach pointed out that domestic production faces direct competition from abroad and that the industry is declining. United States production of iron in pigs for merchant sale, he said, declined from 9,523,855 tons in 1913 to 7,723,676 tons in 1928, and it was added that more than half of the merchant blast furnaces are idle. Phraseology of the paragraph covering iron in pigs and scrap, it was pointed out, was revised to provide for the assessment of additional duties on alloy metals contained in scrap in line with duties on alloys in other paragraphs. Tungsten steel scrap, worth about 6c. a lb. in Europe, it was stated, has been imported in substantial quantities at the same rate of duty (75c. per ton) as ordinary steel scrap which is obtainable at less than 1c. a lb. in the United States.

Sponge, or granular iron, which is made by the low temperature reduction of iron ore, was described as a comparatively new product in the United States, and is not specifically mentioned in the present act. As it is somewhat similar in use and value to that of muck bars, phraseology descriptive of the commodity was put in the same paragraph as that covering muck bars. The phraseology also was changed, Representative Bacharach said, to include small pieces of muck bars manufactured for use in making steel and heretofore dutiable as scrap iron.

In order to carry out the established policy of special tariff treatment for alloy steels, it was stated, provisions in the present act have been expanded in the bill to embrace the entire range of alloy materials and the products of which they are important components and the minimum dutiable alloy content has been

altered in conformity with present metallurgical practice. It was explained that the present law provides only for alloys contained in steel. Recently, however, Representative Bacharach said, alloys contained in iron, such as stainless iron, have become of increasing importance, and the phraseology of the bill has accordingly been changed to provide for alloys contained in iron. Provision has been made, also, for assessing higher rates of duty on chromium or vanadium contained in steel or iron because of the growing industrial importance of such steels and irons and because of pressure on domestic markets from foreign sources. The rates are compensatory for the rates on chromium and vanadium provided in paragraph 302.

Imports under paragraph 312, "structural shapes," the House was told, have increased from \$131,669 in 1919 to \$5,377,129 in 1928 and constitute the bulk of the rolled steel imported. About 99 per cent of imports under the paragraph, it was said, consist of structural shapes, concrete reinforcement bars and sheet piling. The present rate is $\frac{1}{2}$ c. a lb., a lower rate than is assessed on plain steel bars. As such imported reinforcing bars have consistently undersold the competing domestic articles, Representative Bacharach said, the product was mentioned by name under paragraph 304, where the proposed rate is 3/10 c. a lb.

Cast Iron Pipe at Disadvantage in Meeting Foreign Competition

Imported cast iron pipe, largely from France, was said to have the advantage of production at a low cost in a completely integrated plant and the benefit of relatively low transportation costs to the seaboard markets of the United States. The bill proposes a rate of 30 per cent as against the present duty of 20 per cent.

Discussing the alloys, Representative Bacharach said the only change found necessary in the rates of duty on the ores was in the rate on tungsten ores. Advances in metallurgical practice have been such, it was stated, as to obviate the necessity for corresponding changes in the rates on tungsten alloys.

The domestic electrical machinery industry was declared to be of such importance that separate classification of its products was determined upon, if only for the purpose of securing adequate statistical information. Imports were said to be increasing and to have amounted to approximately \$1,500,000 in 1928. The new paragraph groups the products of the industry according to use and is designed to exclude all articles and parts not in chief value of metal, thus insuring classification of such articles as condenser plates of mica, porcelain insulators, and the like, at rates intended by Congress.

In discussing changes made in rates or classifications on miscellaneous manufactures of metals, Representa-

tive Bacharach spoke of the reasons for proposing an increase to 40 per cent from 35 per cent in the duty on wire rope, imports of which were said to equal about 8.5 per cent of domestic production, while exports amount to only slightly over 3 per cent. It was stated that the rope imported is in some instances of inferior grade and dangerous, especially where human life is dependent upon quality. Imported wire rope was said to be selling in the United States at from \$2 to \$10 per 100 ft., or about 25 to 30 per cent under the lowest price at which the domestic product can be sold.

Imports of wire cloth were said to be substantial, particularly in the fine grades, and to be sold at lower prices than are comparable products

of domestic production. An increase of rates on the finer grades of wire cloth has been proposed and a reclassification provided with increased rates on wire cloth used in paper making, which is now imported, by authority of a Treasury decision, as parts of machinery at 30 per cent.

The increase proposed in the duty on umbrella hardware was said to be intended partially to equalize the existing differences in cost and prices of domestic and foreign material. United States production is estimated at below \$2,000,000, of which 65 per cent was said to be labor cost, and the industry was said to be operating at a loss. Imports, mostly from Germany, were estimated at about 15 per cent of domestic production and to be increasing.

J. D. Wallace & Co. Acquire John T. Towsley Mfg. Co.

J. D. Wallace & Co., Chicago, manufacturers of portable woodworking machinery, have taken over the John T. Towsley Mfg. Co., Cincinnati, manufacturer of woodworking machinery and factory trucks.

The present Wallace national sales organization and engineering service will be the basis of an expansion program which will eventually cover every standard need of the woodworking industry in modern production machinery in various price classes. The acquisition of the John T. Towsley Mfg. Co. is another step in this expansion program, it is announced.

The John T. Towsley Mfg. Co. will continue to operate under its own name, as a separate corporation, a division of J. D. Wallace & Co.

Broken Hill Proprietary Co. Increasing Steel Output

WASHINGTON, May 21.—Pig iron production of the Broken Hill Proprietary Co., Ltd., of Australia, during the four weeks ended Feb. 24, 1929, totaled 27,729 gross tons, compared with 26,316 tons during the preceding four weeks and 14,909 tons during the corresponding period of February, 1928, according to reports received by the Department of Commerce. Comparable production of steel ingots was 26,148 tons, 26,233 tons and 23,613 tons.

The rolling mill activity of the company has been considerably higher this year than in the corresponding period of last year. The increase in output of the blooming mill and of the 28-in. mill (principally rails and structural shapes) is said to be especially noteworthy. Announcements indicate considerable expansion of capacity. One states that a plant is to be built at Newcastle for the production of iron and steel pipe.

Lysaghts, Ltd., the only producer of galvanized sheets in Australia, is

reported to be installing equipment that will approximately double the present output, so that about 50 per cent of the country's galvanized sheet requirements can be supplied.

Empire Steel Disposes of 50,000 Common Shares

The Empire Steel Corporation recently offered to common shareholders the privilege of subscribing for an issue of 50,000 common shares at \$20 per share.

A. I. Davey, secretary of the corporation, states that the management is greatly pleased by the response from the shareholders and the way in which the stock was subscribed for. The amount realized from the sale of these shares will be used to strengthen the capital position of the corporation and for further development.

The corporation has been operating its different plants at capacity and the earnings for 1929 have been unusually good, and recently there has been a very active market for the common shares of Empire Steel Corporation.

Chrome Steel Corporation Formed

Canda Gayley Steel Corporation, recently organized to take over the business of the Chrome Steel Works (see THE IRON AGE, March 14, page 763), has changed its name to the Chrome Steel Corporation. Operations continue to be at Cartaret, N. J. In addition to the officers named at the time of first reorganization, Sidney G. Myers, of San Francisco, for many years representative of the old Chrome Steel Works, will be Western representative of the new corporation.

Central Alloy Steel Corporation has moved its New York office from the Pershing Square Building to the New York Central Building, 230 Park Avenue.

This Issue in Brief

Tungsten-carbide cutting alloy tipped in holder requires firm support. Tip must fit seat closely and have contact over not less than three sides. Brazing can be done with either copper or brass.—Page 1414.

* * *

Anneals malleable iron in three-day cycle. Furnace is of electric elevator type and is now in commercial use. Practically all compositions of white iron have been properly graphitized in short heat cycles.—Page 1413.

* * *

If imports amounted to more than 5 per cent of domestic production, additional tariff protection was considered, says head of metal schedule sub-committee. The "Garner" yardstick was used in preparing the schedule.—Page 1431.

* * * *

Fusion welding cuts cost of producing welded pipe because only a fraction of the metal on each side of the seam to be welded need be heated. Old method requires heating the entire periphery.—Page 1410.

* * *

Cutting tungsten-carbide pieces from bar is a difficult operation. No matter how carefully grinding is done, the alloy fractures before grinding is completed. Best procedure is to grind on flat side, directly into the piece, until it cracks.—Page 1414.

* * *

Polishing room of radiator shell department has six parallel overhead conveyor lines. Three conveyors, all operated by the same drive, make a complete turn in the department, serving two double rows of polishing machines, and carrying radiator shells from rough polishing to semi-finish and finish polishing operations.—Page 1405.

Overhead cost should be applied to the cost of the product in the same proportion, to the total overhead of the departments doing the work, which the time consumed in processing the product bears to the total available productive time of the departments in which the work is done. Any other method results in inaccurate costs, says cost consultant.—Page 1425.

* * *

Buffing operation is entirely eliminated by machining with diamond tools. Diamond, however, is not suitable for roughing cuts. It can be used satisfactorily in conjunction with tungsten-carbide tools. — Page 1417.

* * *

Open-hearth men prefer American magnesite. In some instances Canadian product is favored, but Austrian magnesite is no longer considered as satisfactory as American. — Page 1420.

* * *

Sheet jobbers declare loss in business is partly due to producers' acceptance of mixed carload orders. May ask Federal Trade Commission to conduct an investigation of the jobbers' problems and grievances.—Page 1423.

* * *

Machining with tungsten carbide reduces size variation, says user. No adjustment is required throughout a day's run, and no difference in size between first and last piece can be detected.—Page 1415.

* * *

Don't alter your overhead cost rates because the plant happens to be very busy or very slack. Only when a complete cycle of plant operations is compassed is a true picture of overhead available, says cost expert. Overhead cost should be based on normal scale of plant operations.—Page 1426.

Increased output of 30 per cent claimed for new open-hearth furnace. "Keen" furnace has two fore-chambers preceding the main chamber, which is short but of considerable depth. Slag is tapped from the slag pocket about twice a week, avoiding the usual accumulation.—Page 1421.

* * *

Problem of getting trained help for sharp production increases is solved by progressive assembly system. Work of assembling automobile seat backs is divided so finely that each operator can quickly learn a part of the work. Assembling is done on a chain-type conveyor, running on its edges.—Page 1408.

* * *

Tungsten-carbide tools require a sharp cutting angle, to reduce chip pressure. If a large rake angle is used, absolute rigidity is essential, to avoid crumbling at the edge.—Page 1414.

* * *

Increased daily output of blast furnaces would result from sintering the finer sizes of Mesabi ores, and crushing and sizing the hard, coarser ores, according to Bureau of Mines investigation. Fuel consumption would be lower and dust losses would decrease.—Page 1409.

* * *

Many machine tools frequently are over-powered. Investigation reveals that motorization of machine tools is in a chaotic condition. Sometimes machine tool maker specifies the motor size, in other cases, the user. Tests in one plant resulted in reduction of motor installations from 2100 to 1100 h.p.—Page 1418.

* * *

Load is not equally distributed when more than one pair of gear teeth are in contact. Owing to the elasticity of the teeth, the load distribution is non-uniform, and each pair of teeth passes through a regulation loading cycle.—Page 1427.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

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The O'Fallon Decision

WHEN he inspired legislation involving a valuation of the railroads of the United States the late Senator La Follette started a long trail of trouble and expense. His theory was that the railroads were exacting rates from the public that enabled them to pay dividends on watered stock. The Interstate Commerce Commission, which was instructed to make this valuation, soon saw that the hypothesis was utterly incorrect, but out of political consideration its animating purpose has been to concede to the railroads the minimum that it could conceive. This produced results that naturally have been contested by the railroads. In several cases that went to the Supreme Court the real issue was not brought out. Hence Monday's decision of the court in the case of the St. Louis & O'Fallon has been awaited with great concern, for it has been recognized that in it the issue was sharply drawn. While it was a complete rebuke to the Interstate Commerce Commission, on the other hand it does not entirely clarify the position of the railroads.

The decision rested mainly on the ground that the Interstate Commerce Commission had disregarded the provision of the Transportation Act of 1920 making it mandatory that due consideration be given to present value. A minority of the court in a dissenting opinion held that the commission had done so, but the majority of the court ruled that it had not, and quoted the opinion of a minority of the commission itself that "the function of this commission is not to act as an arbiter in economics, but as an agency of Congress, to apply the law of the land to facts developed of record in matters committed by Congress to our jurisdiction."

It is unnecessary now to dwell upon the academic method of valuation developed by the commission, which in essence was actual investment in 1914 plus additions at cost since then, less depreciation. In 1920 the tentative estimate of the commission on this basis was 18.9 billions of dollars for the total railroad valuation. As it proceeded with its studies, however, it became clear that it was going to arrive at a total of 23 to 25 billion dollars. The railroads estimated that if their property had to be reproduced the cost would be something like 38 billion.

The bone of contention has been whether in a period of inflation, or of a rise in general price level, during which the values of many kinds of property, houses for example, have been written up, the operation of economic factors should be restricted against the railroads by the power of State control. The Supreme Court now answers that question in the

negative and says that Congress in 1920 did not order anything otherwise.

The Supreme Court does not, however, suggest what, in its opinion, the valuation of the railroads ought to be, although it gives indications of what it considers to be the correct principles, and cites numerous previous decisions of its own, including the Southwestern Bell Telephone and Indianapolis Water cases. It says:

The elements of value recognized by the law of the land for rate-making purposes have been pointed out many times by this court. * * * Among them is the present cost of construction or reproduction. * * * It is impossible to ascertain what will amount to a fair return upon properties devoted to public service without giving consideration to the cost of labor, supplies, etc., at the time the investigation is made. An honest and intelligent forecast of probable future values made upon a view of all the relevant circumstances is essential. If the highly important element of present costs is wholly disregarded such a forecast becomes impossible. Estimates for tomorrow cannot ignore prices of today. The doctrine above stated has been consistently adhered to by this court.

Our interpretation of the decision is that it repudiates the attempt of the Interstate Commerce Commission to enforce a valuation formula of its own invention. On the other hand it does not substitute the principle of reproduction costs, although it says that this must be taken into consideration. This is sound economics from the engineering and financial standpoints, if not from the collegiate. We discern in the decision the opinion that the true basis of valuation is the capitalization of expected earning capacity, which is thoroughly sound, for it is precisely upon such a basis that investors are led to embark in new enterprises.

If one of the existing trunk lines between New York and Chicago had to be rebuilt, reproduction cost would be a powerful element in the economic calculation. If on the other hand a railroad has become useless, ceasing to have any earning capacity, reproduction cost is no element of valuation whatsoever.

The great difficulty in determining the expected earning capacity of the railroads and other public services is the restriction upon their freedom that is imposed by law. The Supreme Court has refrained from indicating what the railroads ought to earn, but it has made it clear that, Congress having restricted the rate of return on their capital, the Interstate Commerce Commission may not arbitrarily write down the capital itself.

High Point for Electric Steel

NEW records in steel are common, but mention should not be omitted of the great advance made by electric steel in this country in 1928. Production of electric steel ingots and castings last year was 802,260 gross tons, an increase of 136,173 tons, or 20.5 per cent, upon the 666,087 tons made in 1927. The largest previous increase was in 1925, when 182,986 tons or 42 per cent more was produced than in 1924.

Electric ingot production at 453,692 tons was 56.5 per cent of the total electric output, compared with 55.7 per cent in 1927, and the largest percentage in the history of the industry. In electric alloy steel also a new record was made. The 433,096 tons produced was 54 per cent of the total electric output, the largest proportion on record. This gages the large increase last year in the demand for stainless, or rustless, iron. Large quantities of this product, which at present can be made only in electric furnaces, are being used in the nitric acid plants of several important chemical companies.

Demand for electric steel castings was greater than ever last year. At 348,568 tons not only was a new high figure reached, but this class of castings more than kept pace with the increase in total steel castings, its percentage being 28.5. The nearest approach to this was in 1927, when the electric steel casting output was 25.4 per cent of the total.

It is significant that American manufacture and use of electric steel should have had such a growth since the war, whereas Europe in the same time has gone backward. Great Britain and Germany had a smaller output in 1927 (the last year for which there are official statistics) than in 1918, while France had substantially the same output (around 100,000 tons) in the two years. In the United States the 1927 total was roundly 30 per cent beyond that of 1918.

Economics of the Farm Bills

A RETROSPECT of the wheat market during the last year illuminates the political controversy that is now going on in Washington. The price for wheat has been steadily declining. There is an hypothesis that when the farmer harvests his crop he is constrained to accept the low prices offered by millers and speculators, who profit from a subsequent rise. It is this thought that underlies the House bill, with its provisions for cooperative holding and selling, with the aid of a Governmental revolving fund. It is obvious, however, that the farmers who sold their product right after the last harvest did better for themselves than those who are selling now; and that if a farm board had essayed to play the market the dissipation of the revolving fund would already have been far advanced.

Another hypothesis has been that the farmers have been mulcted by the railroads for the transportation of their product, and this thought underlies the present movement toward raising freight rates on other commodities in order to reduce them on agricultural products. A few weeks ago the railroads voluntarily made a substantial reduction in the freight rate on grain to promote the movement thereof. This was immediately followed by a further decline in the

price for wheat, the sellers of which took advantage of the concession the better to meet the competition of Canada and the rest of the world.

These experiences illustrate amply that means for holding back supplies and reduction in freight rates, either or both, do not help the farmer in an overstocked market. The trouble is that there was too large a production in 1928, too large a carry-over, and the prospect of too large a planting this year.

The woes of the wheat grower and other farmers are economic and the farmers themselves collectively are largely responsible for them. Crippling of the railroads and endangering the taxpayers in visionary plans to help them are fol-de-rol. We might cheerfully give them half a billion dollars with which to speculate if we felt that it was going to make them happy. But we can see that it isn't, so what's the use? The Senate, much as it is objurgated, has a keener perception. It sees that there isn't any use and that the only way to make the farmer happy is to give him a bonus. The specious argument is that manufacturers have been given a bonus through the tariff, so why not the farmers in a different disguise? Really the Senate is more logical than the House. This is not to say that the Senate ought to get what it wants, for the very idea of a bonus on production is abhorrent. We may rely upon the President to kill the pending project. The issue has now been sharply drawn between populist vagaries and sound economics; and the President has alined himself on the side of sense vs. nonsense.

Interest Rise an Anachronism

THE rise in interest rates during approximately a year past is an anachronism, for two reasons. In the first place, rates commonly fall after a great war, and in the second place as a country grows older rates tend to fall. We need not only an explanation of the recent rise but a study of the causes, to judge whether anything has gone wrong.

As to war influence: The yield on British consols averaged close to 5 per cent during and for a short time after the Napoleonic wars, going below 4 per cent about 1821, below 3 per cent in the late eighteen eighties, and to about 2½ per cent in the depression of the eighteen-nineties following the Baring failure. On the recovery the rate scarcely rose to 3½ per cent. As to the maturity of the United States, the crucial test is that before the war we were a debtor nation, while since then we have been a creditor nation. There is the economist's "disinclination of capital to emigrate." It requires a higher rate in any country to attract capital to it, and the country would export capital only when there were decidedly less favorable returns at home.

There has been such heat in the controversy over stock speculation and loans to brokers that if there were any bystanders they would be unlikely to give face value to the arguments on either side.

Substantially the whole dispute has been over the claim that too much capital has been going into stock speculation. Nobody questions whether too much capital may be going into other things. That is, "business," which too many people consider reserved from criticism. However, the two things ought to be able to take care of each other, so to speak. Were business

going at too strong a pace the stock market should discount the trouble it is making for, and in the past it has done so. Were the stock market going at too strong a pace it should relax, whereupon capital could be offered to industry on more favorable terms than are now available, and thereby business be stimulated.

Admitting that there is danger, it falls into two categories, distinguished by the two places into which capital may be put—the stock market and industry. If too much capital is placed in industry, if the pace of development is too strong, there follows a period of readjustment while the consuming potentialities of the people increase to take up the slack. That is a long and painful process, involving physical loss while facilities lie idle. A readjustment in the stock market is quick and does not involve physical loss. All this would seem quite simple if one did not know better. Where the shoe pinches is that people believe a break in the share market will spoil business, regardless of the theory that the release of capital should stimulate business.

STUDENTS of trends in iron and steel will not overlook the small proportion of the 1928 output of pig iron and ferroalloys that was made for sale—only 21.8 per cent. This is the smallest figure in a good many years, probably the smallest on record, comparing with 24.6 per cent in 1927, 25 per cent in

1926, 24.5 per cent in 1925 and 26.4 per cent in 1924. So great has been the demand upon the steel mills that they have found use for increasingly large tonnages of their blast furnace product. Also the shrinkage of 1,300,000 tons in the output of foundry iron last year was a factor in bringing the percentage of marketed pig iron to a new low point. This shrinkage is one index of the changing relation between the production of iron castings and that of rolled steel.

THE large place taken by France as a producer of pig iron and steel is one of the surprises of Europe's recovery from the war. Steel at 9,237,600 tons and pig iron at 9,933,200 tons last year practically doubled the 1913 totals of 4,614,000 tons and 5,126,400 tons. Thus France has moved up into a commanding position, which is maintained this year with a rate higher than the monthly average of 1928. While this advance is attributed largely to the acquisition of the ore resources of Alsace-Lorraine, there has been growing evidence that France is reaping the fruits of her enterprise and thrift, often at the expense of British and German industries. French steel exports are now over eight times those of 1913, though on all hands there was the prediction ten years ago that the country's backwardness in the development of foreign trade in steel products would persist in spite of her new eminence in iron ore.

CORRESPONDENCE

Openness to Developments in Other Industries

To the Editor: I read with much interest your editorial "But Our Business Is Different" in the May 16 issue. I thoroughly agree with you that unwillingness to take new ideas from other industries is a great handicap to development. Of course, the actual expression of a new idea is often so specialized that it does not appear to have any other application than the one for which it was primarily intended. But an effort to dig out the underlying principle will disclose the fallacy of such a position.

The aircraft industry presents a contrast to the prevailing picture. Here is a business which has not existed long enough to be steeped in traditions and prejudices, whose personnel is young and active, and whose development to date, tremendous as it has been, has never attained the volumes usually associated with mass production. It is a business of which it might well be said that it is different. But fortunately the chief expression of that difference is an attitude of willingness to learn and adopt from other industries, and gladly to exchange ideas for mutual advancement. In the first place, the airplane manufacturer realizes that in order to obtain the volume

he is hoping for he must hold prices to a minimum. Therefore, any material, process or part which he can adopt from another industry gives him that mass production which he cannot attain alone. Secondly, many developments which he may foster, no matter how excellent their technical results, can never give him minimum prices if he tries to hold them as a secret. So he is willing to pass them along, not only in his own industry, but to other industries, for in so doing he is increasing volume with its consequent price saving to him.

The work the aircraft industry has done in fostering the development of alloy steels and light alloys, as well as of welding practice, is a good illustration. If the aircraft manufacturer had not been willing to pass out information gained by close application and experiment, so that other industries would use the newer alloys, prices would be much higher than they are today for these products. In fact, it is reasonable to believe that were it not for this broader attitude of the aircraft manufacturer the basic industries would never have been willing to go along so far in this development; the aircraft industry as the sole market would not have warranted it.

Outside of the natural interest in any industry as colorful as aeronautics, it would be worth while for every manufacturer to develop some aeronautical contacts, to observe at first hand this refreshing attitude of a new industry.

CHARLES E. KIRKBRIDE,
Assistant chief draftsman, Naval
Aircraft Factory.

Philadelphia, May 17.

Schedule of the next instalments of the Business Analysis and Forecast, by Dr. Lewis H. Haney, Director, New York University Bureau of Business Research, follows: May 30—Activity in Steel Consuming Industries; June 20—Position of Iron and Steel Producers.



Aviation Industry in Four Main Groups

Changes and Realinements of Companies Are Features of Rapid Expansion—Still About 60 Independents

CONSOLIDATIONS of companies and realinements of groupings, which have been featuring the expansion in the aviation industry, bring the rapidly changing picture to a present status of four principal groups of companies and about 60 so-called independents, according to an analysis made by Ernst & Ernst, accountants, New York. "It is a question whether a fifth large group will be formed from the independents," the statement says, "or whether most of them will gravitate to the existing 'big four.'" The statement follows:

"Aviation companies are merging so fast these days that it takes a score card to keep track of them. Groupings of today are realigned tomorrow. Independents this month become units of combinations next month. The year 1929 will go down in aviation history as the great initial scrambling period. The merging of engineering, design, production, training, local service and trunk line operation has marked the industry's recent expansion.

"The main directions of the currents of consolidation can be pointed out, but necessarily in a rather tentative and incomplete way, because the picture changes kaleidoscopically and the lines of corporate influence drawing the groups together are complicated by interlocking directorates, personal affiliations of like-minded executives and other similarities of purpose, as well as by outright financial control. Subject to these qualifications, it can be stated that there are four main groups:

I. *United Aircraft and Transport Corporation, or Boeing group.* This is often characterized as the "General Motors of the aviation industry," although other groups also may lay claim to the same designation. It was formed late in 1928 and was financed largely by the National City Co. It has the largest outstanding single issue of senior securities of any aviation company. All companies in the group are operated as a unit, although the competitive spirit is fostered to a certain extent, much as in the case of General Motors. It includes both manufacturing and operating companies, and the nucleus is the group of Boeing companies. The board of directors includes many leaders of the aviation and automobile industries. Some of the leading companies in the group are the following:

Boeing Airplane & Transport Corporation, whose subsidiaries are Boeing Airplane Co., manufacturer; Boeing Air Transport, Inc., which operates air mail routes between Chicago and San Francisco; and Pacific Air Transport Co., which operates a Pacific Coast service.

Pratt & Whitney Aircraft Co., manufacturers of Wasp and Hornet motors.

Chance Vought Corporation, manufacturer; Hamilton Aero Mfg. Co. and Hamilton Metalplane Co., manufacturers; Stout Air Lines, Inc., operating between

Detroit, Chicago and Cleveland. The corporation also has a large interest in the Maddux Lines.

II. *Curtiss or Keys group.* This represents greater diversity and larger capitalization than perhaps any other group, but it is not operated so closely as a unit, the affiliation being due rather to the ownership of stock in various enterprises by associated individuals. Most companies are operated independently, and it seems to be the policy to encourage the organization of a large number of relatively small companies, each operating in its special field. The dominant figure in the group is C. M. Keys, who is president of Curtiss Aeroplane & Motor Co., and head of several others. Grouped around Keys are a number of men who control the policies of various concerns. Companies ordinarily assigned to the group include the following:

Curtiss Aeroplane & Motor Co., Curtiss Flying Service, which is sales agent for several companies; Curtiss-Robertson Airplane Mfg. Co.; Curtiss Aero Export Co., Curtiss Assets Corporation, Curtiss-Reid Airplane Co. of Montreal, Curtiss-Caproni Corporation, Aviation Exploration Co., Sperry Gyroscope Co., North American Aviation, Inc., (Investment trust).

Transcontinental Air Transport, in which the Pennsylvania Railroad also is interested, to combine rail-air passenger service from New York to the Pacific Coast.

The following companies do not have very close association in their manufacturing activities, but the Curtiss Flying Service holds exclusive sales contracts in this country for their products: Sikorsky Aviation Corporation, Douglas Co., Cessna Airplane Co., Ireland Co., Command-Aire, Inc.

III. *Wright, or Hoyt, group.* This group is bound together mainly because Richard F. Hoyt is chairman of the board of each, and associated individuals control the policies, but the inter-relations are looser than for some other groups. Hoyt is a partner of Hayden, Stone & Co., through which the financing of the companies is arranged. The number of companies is smaller, and their size is larger than units of other groups. There is a parallel or common interest between this and the Curtiss-Keys group. Companies in the Wright-Hoyt group include:

Wright Aeronautical Corporation; Keystone Aircraft Corporation, and its Loening division; Aviation Credit Corporation, which finances time payments on airplanes and equipment; Travel Air Co., Moth Aircraft Corporation, New York Air Terminals.

Aviation Corporation of the Americas, owing Pan-American Airways, which operates lines from the United States to Latin America. This latter company also has connections with all other groups and with independent interests.

Hoyt and Keys groups are jointly interested in the National Aviation Corporation, on investment trust, which has close

relations with Aviation Securities Corporation, Aviation Corporation of California, Aviation Securities of New England, and Aeronautical Industries. The two groups also are interested in Aviation Credit Corporation, National Air Transport, Inc., (New York-Chicago-Dallas), Transcontinental Air Transport, New York Air Terminals, Stromberg Carburetor Co. and others.

IV. *Aviation Corporation or Harriman group.* This is large holding company, having also investment trust functions, recently organized with \$35,000,000 cash, for acquisition of well established aviation companies. It was backed by a group of financial and investment houses headed by W. A. Harriman & Co. and Lehman Brothers. It also lays claim to being the future "General Motors" of the industry. Among its principal acquisitions to date are:

Fairchild Aviation Corporation, which controls various subsidiaries of that name; Universal Aviation Corporation, which controls Universal Air Lines, Inc.; Robertson Aircraft Corporation, Northern Air Lines, etc.; Southern Air Transport, Inc.; Roosevelt and Curtiss Field, Long Island.

Independents. More than 60 so-called independents are not included in the four groupings above. Fokker Aircraft Corporation of America, which is closely associated with Western Air Express, constitutes one of the most important groups of the so-called independents. A few of the other independents are:

Great Lakes Aircraft Co., Glenn L. Martin Co., Buhl Aircraft Co., Warner Aircraft Engine Co., Pitcairn Aircraft, Inc., Stearman Aircraft Co., Stinson Aircraft Corporation, Mahoney-Ryan Co., Lockheed Aircraft Co., Lincoln Aircraft Co., Consolidated Instrument Co., Claude Neon Lights, Bellanca Aircraft Co., American Eagle Aircraft Corporation, Alexander Industries, Inc., Air Investors, Aero Supply Mfg. Co., National Aircraft Materials, Swallow Airplane Co., United States Air Transport, Consolidated Aircraft, and Allied Aviation Corporation.

R. D. Cole Mfg. Co. 75 Years Old

The R. D. Cole Mfg. Co., Newnan, Ga., is celebrating its seventy-fifth anniversary. The company has grown from a small shop to one of the largest metal-working plants in the South. Its lines of manufacture include steel towers and tanks, standpipes, engines, boilers and castings. The plant has complete machine shop and foundry, a boiler shop and steel plate department. Officers are: R. D. Cole, president; E. G. Cole, vice-president and general manager; Bryan Blackburn, engineer and treasurer. The company has been a continuous subscriber to THE IRON AGE for more than 25 years.

The twenty-fifth anniversary of the founding of the Engineers' Society of Milwaukee was celebrated with a dinner dance at the Westmoor Country Club on Wednesday evening, May 22.

Iron and Steel Markets

Demand for Automobile Steels Recedes

Curtailment of Motor Car Schedules Not Sharp—Railroad Cars, Ships, Gas Line and Fabricating Awards Call for Large Tonnages—Pig Iron Quiet

STEEL output is undiminished and signs of a decline in mill bookings are by no means marked. A further tapering of specifications from the automobile industry is offset, at least in part, by fresh demands from other sources.

Orders for ships, railroad equipment, fabricated steel and line pipe are conspicuous for the large tonnages that they will add to mill books. Contracts for nine ocean vessels, calling for 60,000 tons of steel, have been placed with Eastern shipbuilders subject to approval by the Shipping Board. An equal tonnage will be required for 4000 freight cars bought by the Baltimore & Ohio. Structural steel lettings reached the high total of 53,000 tons, of which 22,500 tons was for an elevated highway in New York. Following closely the placing of 130,000 tons of pipe for a gas line a week ago, an order for 20,000 tons for a line from Monroe to Shreveport, La., has been divided between the Milwaukee fabricator and a Youngstown mill.

Farm equipment makers continue to take steel to support capacity operations, with the likelihood that there will be virtually no curtailment for mid-summer inventories. The unfavorable turn of the grain market, although a source of concern, has not yet affected the demand for agricultural machinery.

Among the smaller steel-consuming groups, the radio industry commands attention because of its growing seasonal needs in sheets. Larger radio makers have full operating schedules extending through the summer into the fall.

Curtailment in the automotive industry is not general and will not materially affect output until June. Reductions in schedules are limited to companies that have large stocks of cars in dealers' hands or are preparing to bring out new models. The latter are expected to reenter the market for steel for July production schedules.

Chicago and Pittsburgh, in contrast with some other centers, report little let-up in the flow of steel business. In the Western district, mills have been unable to improve their deliveries, which average 14 weeks for bars and plates and 10 weeks for structural material. Scarcity of semi-finished steel also remains a factor there, forcing integrated producers to allocate material among their various departments and restricting the operations of non-integrated companies to 85 per cent of capacity. At Pittsburgh, specifications for bars and plates are still ahead of shipments, and the

backlogs of sheet mills are showing almost no reduction.

A relaxation in the demand for sheets would have no immediate effect on mill operations. Unfilled orders of independent sheet producers on May 1 were 44,000 tons larger than one month previous, despite a substantial gain in production. Output in the first third of the year was greater by 116,000 tons than in the corresponding period in 1928, the previous four-month record.

In opening its books for third quarter the American Sheet & Tin Plate Co. has reaffirmed present prices except on blue annealed sheets, on which the new two-base method of quoting will apply. The current quotation of 3c., Pittsburgh, on tin mill black plate is also retained. A number of independents have taken similar action. Advances on other products, notably bars, plates and shapes, are still a possibility, although indications are preponderantly for a reestablishment of current prices.

Alloy steel bar manufacturers have reaffirmed the present price of 2.65c., base mill, for the coming quarter, but have placed square billets under 4 x 4 in., and slabs of equivalent sectional area, on a bar base. Computed on a gross ton basis the effect of the change will be an advance of \$2.50 to \$6.

In the pig iron market no general buying movement for third quarter has yet developed. An exception must be made for the Chicago district, where 65 per cent of the tonnage expected for that period is reported placed. At Pittsburgh, also, there have been a number of fair-sized sales at the recently advanced prices. Elsewhere consumer interest is at a low level. Southern producers, who have large stocks because of the reduced requirements of cast iron pipe plants, continue to press for business in other territories. A substantial tonnage of Alabama basic is reported to have been sold to a California steel plant, for shipment through the Panama Canal.

Foundry melt in the North and East is well maintained. Shipments in the Chicago area in the first half promise to set a new record. Inquiries by automobile companies for quotations on castings for the last half of the year reflect a confidence, not heretofore evident, in the motor car outlook for that period.

Scrap markets continue weak, and at Chicago heavy melting steel has declined 25c. a ton.

Both of THE IRON AGE composite prices are unchanged, pig iron at \$18.71 a ton and finished steel at 2.412c. a lb.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous.
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	May 21, 1929	May 14, 1929	Apr. 23, 1929	May 22, 1928
No. 2 foundry, Philadelphia...	\$21.76	\$21.76	\$21.76	\$20.76
No. 2, Valley furnace.....	18.50	18.50	18.00	17.25
No. 2, Southern, Cin'tl.....	18.69	18.69	18.69	19.19
No. 2, Birmingham.....	15.00	15.00	15.50	15.50
No. 2 foundry, Chicago*.....	20.00	20.00	20.00	18.00
Basic, del'd eastern Pa.....	20.25	20.25	20.25	19.00
Basic, Valley furnace.....	18.50	18.50	18.00	16.00
Valley Bessemer, del'd P'gh..	20.76	20.76	20.26	18.76
Malleable, Chicago*.....	20.00	20.00	20.00	18.00
Malleable, Valley.....	19.00	19.00	18.50	17.25
Gray forge, Pittsburgh.....	19.76	19.76	19.26	18.51
L. S. charcoal, Chicago.....	27.04	27.04	27.04	27.04
Ferromanganese, furnace....	105.00	105.00	105.00	105.00

Rails, Billets, Etc., Per Gross Ton:	May 21, 1929	May 14, 1929	Apr. 23, 1929	May 22, 1928
Rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh..	36.00	36.00	36.00	33.00
Sheet bars, Pittsburgh.....	36.00	36.00	36.00	34.00
Slabs, Pittsburgh.....	36.00	36.00	36.00	33.00
Forging billets, Pittsburgh....	41.00	41.00	41.00	38.00
Wire rods, Pittsburgh.....	42.00	42.00	42.00	44.00
Skelp, grvd. steel, P'gh, lb...	1.85	1.85	1.85	1.85

Finished Steel, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh.....	1.95	1.95	1.95	1.85
Bars, Chicago.....	2.05	2.05	2.05	2.00
Bars, Cleveland.....	1.95	1.95	1.95	2.04
Bars, New York.....	2.29	2.29	2.29	2.19
Tank plates, Pittsburgh.....	1.95	1.95	1.95	1.85
Tank plates, Chicago.....	2.05	2.05	2.05	2.00
Tank plates, New York.....	2.22½	2.22½	2.22½	2.17½
Structural shapes, Pittsburgh..	1.95	1.95	1.95	1.85
Structural shapes, Chicago...	2.05	2.05	2.05	2.00
Structural shapes, New York...	2.19½	2.19½	2.19½	2.14½
Cold-finished bars, Pittsburgh	2.30	2.30	2.30	2.20
Hot-rolled strips, Pittsburgh...	1.90	1.90	1.90	1.85
Cold-rolled strips, Pittsburgh..	2.75	2.75	2.75	3.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Finished Steel, Per Lb. to Large Buyers:	May 21, 1929	May 14, 1929	Apr. 23, 1929	May 22, 1928
Sheets, black, No. 24, P'gh...	2.85	2.85	2.85	2.70
Sheets, black, No. 24, Chicago dist. mill.....	3.05	3.05	3.05	2.80
Sheets, galv., No. 24, P'gh...	3.60	3.60	3.60	3.55
Sheets, galv., No. 24, Chicago dist. mill.....	3.80	3.80	3.80	3.70
Sheets, blue, 9 and 10, P'gh...	2.10	2.10	2.10	2.00
Sheets, blue, 9 and 10, Chicago dist. mill.....	2.30	2.30	2.30	2.15
Wire nails, Pittsburgh.....	2.65	2.65	2.65	2.55
Wire nails, Chicago dist. mill.	2.70	2.70	2.70	2.70
Plain wire, Pittsburgh.....	2.50	2.50	2.50	2.50
Plain wire, Chicago dist. mill.	2.55	2.55	2.55	2.55
Barbed wire, galv., P'gh.....	3.30	3.30	3.30	3.35
Barbed wire, galv., Chicago dist. mill.....	3.35	3.35	3.35	3.40
Tin plate, 100 lb. box, P'gh...	\$5.35	\$5.35	\$5.35	\$5.25

Old Material, Per Gross Ton:	May 21, 1929	May 14, 1929	Apr. 23, 1929	May 22, 1928
Heavy melting steel, P'gh...	\$17.75	\$17.75	\$18.50	\$15.00
Heavy melting steel, Phila...	16.50	16.50	17.00	13.50
Heavy melting steel, Ch'go...	15.25	15.50	16.00	13.00
Carwheels, Chicago.....	14.50	14.50	14.50	13.50
Carwheels, Philadelphia.....	16.50	16.50	16.50	15.50
No. 1 cast, Pittsburgh.....	15.00	15.00	15.50	14.50
No. 1 cast, Philadelphia.....	16.50	16.50	16.50	16.00
No. 1 cast, Ch'go (net ton)...	15.50	15.50	16.00	14.00
No. 1 RR. wrot., Phila.....	16.00	16.00	16.00	15.00
No. 1 RR. wrot., Ch'go (net)...	14.00	14.00	14.00	11.75

Coke, Connellsville, Per Net Ton at Oven:	May 21, 1929	May 14, 1929	Apr. 23, 1929	May 22, 1928
Furnace coke, prompt.....	\$2.75	\$2.75	\$2.75	\$2.60
Foundry coke, prompt.....	3.75	3.75	3.75	3.75

Metals, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....	18.12½	18.12½	18.12½	14.62½
Electrolytic copper, refinery..	17.75	17.75	17.75	14.25
Tin (Straits), New York.....	43.75	44.25	44.75	51.50
Zinc, East St. Louis.....	6.65	6.67½	6.60	6.15
Zinc, New York.....	7.00	7.02½	6.95	6.50
Lead, St. Louis.....	6.75	6.75	6.85	5.97½
Lead, New York.....	7.00	7.00	7.00	6.10
Antimony (Asiatic), N. Y....	9.00	9.00	9.50	11.00

Pittsburgh

Third Quarter Prices for Sheets Announced—Mills Continue Capacity Operations—Price Advances Talked Of

PITTSBURGH, May 21.—In the absence of any marked change in the rate of steel operations or incoming business, interest in this market is concerned largely with third quarter prices. On the lighter products, this situation was clarified this week by the action of the American Sheet & Tin Plate Co. in opening its books for the third quarter and reaffirming present maximum prices on all sheets except blue annealed. On the latter product, the company adopted the new classification, quoting 2.20c. and 2.35c., Pittsburgh, respectively, as base prices on what will now be known as light plates and blue annealed sheets. Black sheets are quoted at 2.95c., Pittsburgh, and galvanized at 3.70c., while automobile body and metal furniture sheets will be offered at 4.10c. and 4.20c., Pittsburgh, respectively.

While these quotations represent no advance over maximum asking prices for the present quarter, a large part of shipments during this period has been billed at prices at least \$2 a ton under the present asking quotations, and, if the latter are adhered to in third quarter contracts, they will mean an advance to most buyers. Independent makers are expected to follow the Corporation in naming third quarter prices.

Non-integrated makers of strip steel are awaiting the announcement of

third quarter semi-finished steel prices before opening their books for future contracts. It now seems certain that the present price on billets, slabs and sheet bars of \$36, Pittsburgh or Youngstown, will be retained for the third quarter contract buying, and some makers suggest an even higher price. Talk of higher prices for bars, shapes and plates is also heard, and an advance would not be surprising in view of the well sold-up condition of mills, particularly on bars and plates. Specifications for these latter

products are still fully equal to shipments, and delivery promises on plates average from six to eight weeks. The fact that 2000 of the 4000 freight cars ordered by the Baltimore & Ohio will probably be built in western Pennsylvania car shops may add materially to backlogs of district plate mills.

Cold-finishing mills are still pressing hard for deliveries of bars, and the demand from the consuming industries is strong and well diversified.

Mills in the Pittsburgh and nearby districts are continuing to operate at practical capacity. Slight declines in the schedules of strip mills and cold-finished bar mills will be reflected in somewhat lighter shipments during May than in March or April, but incoming business in these products is just about sufficient to maintain present operations. Slight curtailment in tin plate schedules during the last week has been offset by higher operations of sheet mills. A large pipe order placed recently in this district will step up operations in the lap-welded pipe departments.

The pig iron market has taken on added interest in the last week with the opening of order books by the Neville Island furnace, which will be

blown in before the end of the month. This furnace is taking business at prices 50c. above the Valley base, with freight rates to points in Allegheny County ranging from 63c. to \$1.13 a ton. On this basis, fair-sized lots of foundry and malleable iron have been sold at \$19.76 and \$20.13, respectively, delivered Pittsburgh.

Pig Iron.—Interest is centered on the possible effect upon the Pittsburgh and Valley markets of the blowing in of the Neville Island furnace late this month. This will be the first strictly merchant furnace to operate in the Pittsburgh district for several years. It has opened its books at f.o.b. furnace prices 50c. above the Valley furnace quotations. With freight rates to points in Allegheny County ranging from 63c. to \$1.13, it will have advantages ranging from 13c. to 63c. over Valley furnaces, which have a freight rate to Pittsburgh district points of \$1.76. Valley furnaces will have to absorb this freight rate in meeting the Neville Island furnace quotations in Pittsburgh, but are expected to maintain their present quotations on iron for delivery in districts where they are at no disadvantage. A user of malleable has placed 4000 tons of this grade for delivery during the third quarter, the business having been divided between two, and possibly three, furnaces at \$20.13, delivered. The Neville Island furnace figured in this deal, and, with a freight rate of 63c., established its price on malleable at \$19.50, furnace. This price was met by a steel company furnace outside the Pittsburgh district and possibly by a Valley maker. The Neville Island furnace price of \$19, or \$19.76, delivered Pittsburgh, on foundry iron was also met by another interest during the week on a sale of a few thousand tons of foundry iron, and both companies are said to have shared in the business. In the Valley, a large sale of basic was made at \$18.50, furnace. One merchant furnace in that district is said to have sold enough iron in the last two or three weeks to cover its output well into September. No other large sales of iron are reported and there is very little inquiry. Occasional carload lots are being sold for spot delivery, but foundry operations are rather

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.80c.
Galv. sheets (No. 24), 25 or more bundles	4.55c.
Blue ann'l'd sheets (No. 10), 1 to 10 sheets	3.45c.
Galv. corrug. sheets (No. 28), per square	\$4.43
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count	60 per cent off list
Machine bolts, 100 count	60 per cent off list
Carriage bolts, 100 count	60 per cent off list
Nuts, all styles, 100 count	60 per cent off list
Large rivets, base per 100 lb.	\$3.50
Wire, black soft ann'l'd, base per 100 lb.	\$3.00 to 3.10
Wire, galv. soft, base per 100 lb.	3.00 to 3.10
Common wire nails, per keg	3.00
Cement coated nails, per keg	3.05

slow and a large producer of sanitary ware is said to have sufficient iron to last into July. Occasional consumers are showing interest in their third quarter requirements, but this interest has developed little or no actual inquiry.

Prices per gross ton, f.o.b. Valley furnace:

Basic	\$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

Prices per gross ton f.o.b. Pittsburgh district furnace:

Basic	\$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to \$1.13.

Semi-Finished Steel.—Makers of semi-finished steel continue to meet the requirements of their customers with some difficulty, but the shortage is probably less acute than it was a month ago. During the last two or three weeks users of semi-finished steel have made efforts to obtain material in other districts, particularly

in eastern Pennsylvania, but the aggregate of such purchases has been small and is doing little to relieve the shortage here. Considerable interest is evidenced in third quarter prices, particularly on sheet bars. Although no formal announcement has yet been made, it is generally thought that the present price of \$36, Pittsburgh or Youngstown, will apply on billets, slabs and sheet bars. This represents an advance of \$1 a ton on sheet bars over second quarter prices and \$2 on billets and slabs. The demand for wire rods is holding up well, and, although supplies are adequate, makers' reserve stocks have been depleted during the last month. The price is steady at \$42, Pittsburgh.

Bars, Shapes and Plates.—Specifications for bars and plates are still somewhat ahead of shipments. Shapes are not quite so active, although demand is generally satisfactory. Deliveries on bars now range from four to six weeks as an average and some makers of plates now have sufficient business for 60 days' operations. The Milwaukee fabricator of steel pipe is said to have placed a small tonnage in this district, but this report is unconfirmed. The Baltimore & Ohio order for 4000 freight cars includes 2000 cars which are likely to be built in this district, thus adding materially to the backlogs of western Pennsylvania plate mills. Some miscellaneous barge orders have been placed in the last two weeks, and, although not involving a large tonnage of steel, they will help to fill out the operating schedules of the large barge builders. Bars are finding a rather general demand, and the diversity of requirements is responsible to a certain extent for extended deliveries. Cold-fining mills are not taking bars at such a high rate as in March and April, but are still pressing for deliveries on some sizes. Structural awards in the immediate vicinity leave something to be desired, but fabricating shops are fairly well engaged and the volume of new inquiry is encouraging. Third quarter prices have not yet been announced, and, although talk of higher quotations is heard, it is generally thought that the present price of 1.95c., Pittsburgh, will be reaffirmed.

THE IRON AGE Composite Prices

Finished Steel

May 21, 1929, 2.412c. a Lb.

One week ago	2.412c.
One month ago	2.412c.
One year ago	2.348c.
10-year pre-war average	1.689c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High	Low
1929	2.412c., April 2:	2.391c., Jan. 8
1928	2.391c., Dec. 11:	2.314c., Jan. 3
1927	2.453c., Jan. 4:	2.293c., Oct. 25
1926	2.453c., Jan. 5:	2.403c., May 18
1925	2.560c., Jan. 6:	2.396c., Aug. 18

Pig Iron

May 21, 1929, \$18.71 a Gross Ton

One week ago	\$18.71
One month ago	18.54
One year ago	17.34
10-year pre-war average	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1929	\$18.71, May 14:	\$18.29, March 19
1928	18.59, Nov. 27:	17.04, July 24
1927	19.71, Jan. 4:	17.54, Nov. 1
1926	21.54, Jan. 5:	19.46, July 13
1925	22.50, Jan. 13:	18.96, July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel	
	Base per Lb.
F.o.b. Pittsburgh mill.....	1.95c.
F.o.b. Chicago.....	2.05c. to 2.15c.
Del'd Philadelphia.....	2.27c.
Del'd New York.....	2.29c.
Del'd Cleveland.....	1.95c. to 2.00c.
F.o.b. Lackawanna.....	1.95c. to 2.00c.
F.o.b. Birmingham.....	2.05c.
F.o.b. Pacific ports.....	2.15c.
F.o.b. San Francisco mills.....	2.35c. to 2.40c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.....	2.05c.
F.o.b. Pittsburgh mills, cut lengths.....	2.30c.
F.o.b. Birmingham, mill lengths.....	2.15c.

Rail Steel

F.o.b. mills, east of Chicago dist.....	1.85c. to 1.90c.
F.o.b. Chicago Heights mill.....	1.95c.
Del'd Philadelphia.....	2.27c.

Iron

Common iron, f.o.b. Chicago.....	2.05c. to 2.10c.
Refined iron, f.o.b. P'gh mills.....	2.75c.
Common iron, del'd Philadelphia.....	2.12c.
Common iron, del'd New York.....	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.95c.
F.o.b. Chicago.....	2.05c.
F.o.b. Birmingham.....	2.15c.
Del'd Cleveland.....	2.14c.
Del'd Philadelphia.....	2.15c.
F.o.b. Coatesville.....	2.05c.
F.o.b. Sparrow Point.....	2.05c.
F.o.b. Lackawanna.....	2.05c.
Del'd New York.....	2.22½c.
C.i.f. Pacific ports.....	2.20c. to 2.30c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill.....	1.95c.
F.o.b. Chicago.....	2.05c. to 2.15c.
F.o.b. Birmingham.....	2.15c.
F.o.b. Lackawanna.....	2.05c.
F.o.b. Bethlehem.....	2.05c.
Del'd Cleveland.....	2.14c.
Del'd Philadelphia.....	2.01c. to 2.06c.
Del'd New York.....	2.14½c.
C.i.f. Pacific ports.....	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh.....	2.00c.
Wider than 6 in., P'gh.....	1.90c.
6 in. and narrower, Chicago.....	2.20c.
Wider than 6 in., Chicago.....	2.10c.
Cooperage stock, P'gh.....	2.20c.
Cooperage stock, Chicago.....	2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill.....	2.30c.
Bars, f.o.b. Chicago.....	2.30c.
Bars, Cleveland.....	2.35c.
Shafting, ground, f.o.b. mill.....	2.65c. to 3.60c.
Strips, P'gh.....	2.75c. to 2.85c.
Strips, Cleveland.....	2.75c. to 2.85c.
Strips, del'd Chicago.....	3.05c. to 3.15c.
Strips, Worcester.....	2.90c. to 3.00c.
Fender stock, No. 20 gage, Pitts-	
burgh or Cleveland.....	4.25c. to 4.35c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland, to jobbers and retailers.)

	Base per Keg
Wire nails.....	\$2.65 to \$2.75
Galvanized nails.....	4.65 to 4.75
Galvanized staples.....	3.35 to 3.45
Polished staples.....	3.10 to 3.20
Cement coated nails.....	2.65 to 2.75

Base per 100 Lb.

Bright plain wire, No. 6 to No. 9	\$2.50 to \$2.60
gauge.....	
Annealed fence wire.....	2.65 to 2.75
Spring wire.....	3.50 to 3.60
Galv'd wire, No. 9.....	3.10 to 3.20
Barbed wire, galv'd.....	3.30 to 3.40
Barbed wire, painted.....	3.05 to 3.15
Woven wire fence (per net ton to	
retailers).....	65.00

Chicago district mill and delivered Chicago prices are \$1 per ton above the foregoing. Birmingham mill prices \$3 a ton higher; Worcester, Mass., (wire) mill \$3 a ton higher on production of that plant; Duluth, Minn., mill \$2 a ton higher; Anderson, Ind., \$1 higher.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or North-	
umberland, Pa.....	\$2.70
Less carloads, Wheeling or Reading.....	2.80

Sheets

Blue Annealed

	Base per Lb.
Nos. 9 and 10, f.o.b. P'gh.....	2.10c. to 2.20c.
Nos. 9 and 10, f.o.b. Chicago dist.....	2.30c.
Nos. 9 and 10, del'd Cleveland.....	2.29c. to 2.39c.
Nos. 9 and 10, del'd Philadelphia.....	2.42c. to 2.52c.
Nos. 9 and 10, f.o.b. Birmingham.....	2.25c. to 2.35c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh.....	2.85c. to 2.95c.
No. 24, f.o.b. Chicago dist. mill.....	3.05c.
No. 24, del'd Cleveland.....	3.04c. to 3.14c.
No. 24, del'd Philadelphia.....	3.17c. to 3.27c.
No. 24, f.o.b. Birmingham.....	3.00c. to 3.10c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh.....	4.10c. to 4.20c.
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Galvanized

No. 24, f.o.b. Pittsburgh.....	3.60c. to 3.70c.
No. 24, f.o.b. Chicago dist. mill.....	3.80c.
No. 24, del'd Cleveland.....	3.79c. to 3.89c.
No. 24, del'd Philadelphia.....	3.92c. to 4.02c.
No. 24, f.o.b. Birmingham.....	3.75c. to 3.85c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh.....	3.00c.
No. 28, f.o.b. Chicago dist. mill.....	3.10c.

Automobile Body Sheets

No. 28, f.o.b. Pittsburgh.....	4.10c.
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Long Ternes

No. 24, 8-lb. coating, f.o.b. mill.....	4.00c.
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Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh.....	3.90c.
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Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills.....	\$5.35
Standard cokes, f.o.b. Gary.....	5.45

Terne Plate

(F.o.b. Morgantown or Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C. \$11.20 | 25-lb. coating I.C. \$16.70
15-lb. coating I.C. 14.00 | 30-lb. coating I.C. 17.75
20-lb. coating I.C. 15.30 | 40-lb. coating I.C. 19.85

Alloy Steel Bars

(F.o.b. makers' mill)

Alloy Quality Bar Base, 2.65c. to 2.75c. per Lb.

S.A.E. Series Numbers	Alloy Differential
2000 (½% Nickel).....	0.25
2100 (1½% Nickel).....	0.55
2300 (3½% Nickel).....	1.50
2500 (5% Nickel).....	2.25
3100 Nickel Chromium.....	0.55
3200 Nickel Chromium.....	1.35
3300 Nickel Chromium.....	3.80
3400 Nickel Chromium.....	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum).....	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum).....	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel).....	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium).....	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium).....	0.45
5100 Chromium Spring Steel.....	0.20
6100 Chromium Vanadium Bars.....	1.20
6100 Chromium Vanadium Spring Steel.....	0.95
9250 Silicon Manganese Spring Steel (flats).....	0.25
Rounds and squares.....	0.50
Chromium Nickel Vanadium.....	1.50
Carbon Vanadium.....	0.95

Above prices are for hot rolled steel bars, forging quality. The ordinary differential for cold-drawn bars is ¾c. per lb. higher. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis. For billets under 4 x 4 down to and including 2½ in. squares, the price is \$5 a gross ton above the 4 x 4 billet price.

Slabs with sectional area of 16 in. or over carry the billet price; slabs with sectional area of 12 in. to 16 in. carry a \$5 extra above the billet price and slabs with a sectional area under 12 in. carry the bar price.

Band sizes are 40c. per 100 lb. higher.

Rails

	Per Gross Ton
Standard, f.o.b. mill.....	\$43.00
Light (from billets), f.o.b. mill.....	36.00
Light (from rail steel), f.o.b. mill.....	34.00
Light (from billets), f.o.b. Ch'go mill.....	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ½ in. and larger.....	\$2.80
Spikes, ¼ in. and smaller.....	2.50
Spikes, boat and barge.....	3.00
Tie plates, steel.....	2.15

Angle bars.....	\$2.75
Track bolts, to steam railroads.....	\$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count.....	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld	
Steel	Iron
Inches	Inches
Black Galv.	Black Galv.
1½.....	1½ and ¾.....
2.....	2.....
2½.....	2½.....
3.....	3.....
3½.....	3½.....
4.....	4.....
4½.....	4½.....
5.....	5.....
5½.....	5½.....
6.....	6.....
6½.....	6½.....
7.....	7.....
7½.....	7½.....
8.....	8.....
8½.....	8½.....
9.....	9.....
9½.....	9½.....
10.....	10.....
10½.....	10½.....
11.....	11.....
11½.....	11½.....
12.....	12.....

Lap Weld

2.....	23	9
2½ to 6.....	23½	13
7 and 8.....	24	30
9 and 10.....	24½	29
11 and 12.....	25	16

Butt Weld, extra strong, plain ends

1½.....	24½	1½ and ¾.....	+13	+48
2.....	25½	2.....	23	7
2½.....	26½	2½.....	28	12
3.....	27½	3.....	31	15
3½.....	28½	3½.....	34	18
4.....	29½	4.....		
4½.....	30½	4½.....		
5.....	31½	5.....		
5½.....	32½	5½.....		
6.....	33½	6.....		
6½.....	34½	6½.....		
7.....	35½	7.....		
7½.....	36½	7½.....		
8.....	37½	8.....		
8½.....	38½	8½.....		
9.....	39½	9.....		
9½.....	40½	9½.....		
10.....	41½	10.....		
10½.....	42½	10½.....		
11.....	43½	11.....		
11½.....	44½	11½.....		
12.....	45½	12.....		

Lap Weld, extra strong, plain ends

2.....	53	42½	1½.....	29	13
2½ to 4.....	57	46½	2½ to 4.....	34	20
4½ to 6.....	56	45½	4½ to 6.....	33	19
7 to 8.....	52	39½	7 and 8.....	31	17
9 and 10.....	45	32½	9 to 12.....	21	8
11 and 12.....	44	31½			

On carloads the above discounts on steel pipe are increased on block by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel	Charcoal Iron
Inches	Inches
2 in. and 2½ in.....	40
2½ in.—2¾ in.....	48
3 in.....	54
3½ in.—3¾ in.....	56
4 in.....	59
4½ in. to 6 in.....	48
1½ in.....	1
1¾ in.....	8
2 in.—2¼ in.....	13
2½ in.—2¾ in.....	16
3 in.....	17
3½ in. to 3¾ in.....	18
4 in.....	20
4½ in.....	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal, Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn	
1 in.....	63
1½ to 1¾ in.....	55
1¾ in.....	39
2 to 2½ in.....	34
2½ to 3 in.....	42
3 in.....	54
3½ in.....	48
3¾ to 3½ in.....	50
4 in.....	53
4½, 5 and 6 in.....	42

Hot Rolled

2 and 2½ in.....	40
2½ and 3 in.....	48
3 in.....	54
3½ to 3¾ in.....	56
4 in.....	59
4½, 5 and 6 in.....	48

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb. base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage take mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30%, base (carloads).....	55
Carbon, 0.30% to 0.40%, base.....	50
Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.	

Rails and Track Supplies.—Specifications are holding up as well as could be expected at this season, but shipments are gradually declining. New business is mostly in small lots, as large buyers are generally well covered. Prices are well maintained on track supplies.

Wire Products.—Unseasonable weather is being felt in the wire and nail industry, and there has been a slight check in both specifications and shipments of wire going to the agricultural sections. This is particularly true in the case of the jobbing trade in the South and Southwest, where flood conditions prevail and where barbed wire, fencing and kindred products are moving rather slowly from jobbers' stocks. Manufacturers' wire is still in active demand and shipments are equal to those of April in most cases; lighter specifications are being received from some quarters, but the seasonable decline is less than usual. Nails, like agricultural wire products, are feeling the effects of the late spring.

Tubular Goods.—The large gas line placed in the South last week, of which approximately 65,000 tons went to the Steel Corporation subsidiary, will improve operations of lapweld mills in this district considerably. Another line, calling for slightly over 100 miles of 20-in. pipe, and extending from Monroe to Shreveport, La., has been divided between the Milwaukee fabricator and a Youngstown mill, the latter having taken about a third of the tonnage. The demand for butt-welded pipe for the building trades is rather slow in gaining momentum, but is showing slight improvement from week to week. Business in the oil country is below normal. Mechanical tubing is moving to the automotive industry at an undiminished rate, and there is a steady demand for boiler tubes.

Sheets.—The American Sheet & Tin Plate Co. has opened its books for third quarter, reaffirming all present prices except on blue annealed sheets on which the new classification will apply. On light plates, or No. 12 gage and heavier, the price will be 2.20c., base Pittsburgh, for Nos. 9 and 10 gage, while blue annealed sheets, now including only No. 13 gage and lighter, will be quoted at 2.35c., base Pittsburgh, for No. 13 gage. Other companies in this district have adopted the new schedule on blue annealed and are generally expected to follow the leading interest in naming third quarter price of 2.95c. and 3.70c., Pittsburgh, respectively, on black and galvanized sheets. Automobile body sheets are quoted at 4.10c., Pittsburgh, and furniture sheets at 4.20c. Specifications for sheets are holding up remarkably well and are still practically equal to shipments. Mills are unable to accommodate further orders for second quarter delivery except in unusual cases. Delivery promises on some grades extend well into July. Most of the business now on mill books was taken at prices \$2 a ton under the new asking quotations, and

the maintenance of the third quarter figures will mean an advance for many large buyers. Mill operations in this and nearby districts are being kept at near capacity and this rate seems assured for the remainder of the quarter.

Tin Plate.—This is a period of some hesitancy in the tin plate trade and specifications from the food container manufacturers have fallen off slightly in the last week. Adverse weather conditions in all parts of the country offer a ready explanation for this, but it is too early to predict the effect which floods and cold weather will have upon the canning crops. Only the most pessimistic estimates point to any marked falling off in tin plate consumption during the second half of the year. Operations have declined a few points in the last week or two and the industry as a whole is probably not operating at more than 95 per cent of capacity, as compared with 98 to 100 per cent earlier in the month. The second half price has not yet been announced, but will probably remain at \$5.35 per base box.

Cold-Finished Steel Bars.—Specifications against contracts have improved slightly in the last week and were fully equal to shipments with some makers. The present month, however, will show a slight decline in shipments as compared with March and April. Deliveries on some sizes may now be made in two or three weeks, but cold-rolling mills are largely dependent on hot mill schedules, where pressure for deliveries is still being felt. New business is encouraging, and consumers are showing interest in their third quarter requirements. No advance in price is expected. There is still a considerable tonnage on company books placed at figures \$2 a ton under the present asking quotation of 2.30c., Pittsburgh.

Hot-Rolled Strip.—Makers of this product report slightly heavier specifications in the last week or two and the total for the month thus far shows a comfortable increase over the corresponding period in April. Shipments are well sustained, and the present rate of incoming orders leaves little opportunity for an early slowing down. Non-integrated makers, faced with the probability of paying more for their semi-finished steel in the third quarter, are considering advances in price, but no announcement is likely until the semi-finished quotations are established. Present quotations of 1.90c. and 2c., Pittsburgh or Cleveland, are being well maintained.

Cold-Rolled Strip.—Mills continue to watch closely for signs of curtailment in automobile production, but heavy specifications for June indicate little, if any, slackening in the present schedules. Operations and shipments are being continued at about the rate which has prevailed for several weeks, and present specifications are almost equal to shipments. Delivery promises average about four weeks. Mills have not yet opened their third quarter contract books, but the present

quotations of 2.75c. to 2.85c., Pittsburgh or Cleveland, probably will be retained.

Coal and Coke.—The H. C. Frick Coke Co. has added 400 or 500 ovens in the Connellsville district, but the supply of furnace coke is now well adjusted to demand and the additional capacity will likely have little effect on the market. Furnace grades are still quotable at \$2.75 to \$2.85 a net ton, Connellsville, and there is no change in foundry coke prices. Shipments on contract are being made steadily, but foundry operations leave something to be desired, with resultant curtailment in coke requirements at some points. The coal market is still very unsatisfactory. Lake shipments seem to be somewhat lighter than usual.

Old Material.—Although consumer buying of consequence has been lacking in the past week, the market is not appreciably weaker. Small sales of heavy melting steel are said to have been made at prices ranging from \$17.50 to \$18, or even higher, but the lower figure seems to be as much as mills would pay for any considerable tonnage. All the principal consumers of scrap in the district seem to be well supplied for several weeks and are not anxious to make additional purchases, in view of the uncertainty of steel operations during the second half of the year. Compressed sheet steel is still quotable at \$17.50 to \$18. Dealers are able to buy both this grade and heavy melting steel at \$17.25 or lower. The blast furnace grades are weaker, the spread now ranging from \$11.50 to \$12, against \$11.50 to \$12.50 a week ago, and acid open-hearth materials have eased off 25c. a ton. Scrap is growing more plentiful in outlying districts, and dealers are having little trouble in accumulating ample supplies.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel.....	\$17.25 to \$18.00
No. 2 heavy melting steel.....	15.50 to 16.00
Scrap rails.....	17.00 to 17.50
Compressed sheet steel.....	17.50 to 18.00
Bundled sheets, sides and ends.....	16.00 to 16.50
Cast iron carwheels.....	16.00 to 16.50
Sheet bar crops, ordinary.....	18.50 to 19.00
Heavy breakable cast.....	13.00 to 13.75
No. 2 railroad wrought.....	17.75 to 18.25
Hvy. steel axle turnings.....	15.75 to 16.75
Machine shop turnings.....	10.75 to 11.25
Acid Open-Hearth Grades:	
Railr. knuckles and couplers.....	20.25 to 20.75
Railr. coil and leaf springs.....	20.25 to 20.75
Rolled steel wheels.....	20.25 to 20.75
Low phos. billet and bloom ends.....	22.00 to 22.50
Low phos., mill plates.....	22.00 to 22.50
Low phos., light grades.....	20.00 to 20.50
Low phos., sheet bar crops.....	20.00 to 21.00
Heavy steel axle turnings.....	15.75 to 16.75
Electric Furnace Grades:	
Low phos., punchings.....	19.50 to 20.50
Hvy. steel axle turnings.....	15.75 to 16.75
Blast Furnace Grades:	
Short shovelling steel turnings.....	11.50 to 12.00
Short mixed borings and turnings.....	11.50 to 12.00
Cast iron borings.....	11.50 to 12.00
Rolling Mill Grades:	
Steel car axles.....	21.50 to 22.00
Cupola Grades:	
No. 1 cast.....	15.00 to 16.00
Rails 3 ft. and under.....	19.50 to 20.50

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms	
	Per Gross Ton
Rerolling, 4 in. and under 10 in., Pittsburgh	\$36.00
Rerolling, 4 in. and under 10 in., Youngstown	36.00
Rerolling, 4 in. and under 10 in., Cleveland	36.00
Rerolling, 4 in. and under 10 in., Chicago	37.00
Forging quality, Pittsburgh	41.00

Sheet Bars	
	(Open Hearth or Bessemer)
	Per Gross Ton
Pittsburgh	\$36.00
Youngstown	36.00
Cleveland	36.00

Slabs	
	(8 in. x 2 in. and under 10 in. x 10 in.)
	Per Gross Ton
Pittsburgh	\$36.00
Youngstown	36.00
Cleveland	36.00

Skelp	
	(F.o.b. Pittsburgh or Youngstown)
	Per Lb.
Grooved	1.85c. to 1.90c.
Universal	1.85c. to 1.90c.
Sheared	1.85c. to 1.90c.

Wire Rods	
	(Common soft, base)
	Per Gross Ton
Pittsburgh	\$42.00
Cleveland	42.00
Chicago	43.00

Prices of Raw Material

Ores	
	Lake Superior Ores, Delivered Lower Lake Ports
	Per Gross Ton
Old range Bessemer, 51.50% iron	\$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40
Foreign Ore, c.i.f. Philadelphia or Baltimore	
	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	10.00c.
Iron ore, low phos., Swedish, average 68% iron	10.00c.
Iron ore, basic Swedish, average 65% iron	9.00c.
Manganese ore, washed, 52% manganese, from the Caucasus	33.00c. to 35.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	33.00c. to 35.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	\$16.25 to \$16.50
Chrome ore, 45 to 50% Cr ₂ O ₃ , crude, c.i.f. Atlantic seaboard	
	Per Gross Ton
	\$22.00 to \$24.00
Molybdenum ore, 85% concentrates of MoS ₂ , delivered	
	Per Lb.
	50c. to 55c.

Coke	
	Per Net Ton
Furnace, f.o.b. Connellsville prompt	\$2.75 to \$2.85
Foundry, f.o.b. Connellsville prompt	3.75 to 4.85
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal	
	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	\$1.25 to \$1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, 3/4-in., f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	80c. to 90c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese	
	Per Gross Ton
Domestic, 80%, seaboard	\$105.00
Foreign, 80%, Atlantic or Gulf port, duty paid	105.00

Spiegeleisen	
	Per Gross Ton Furnace
Domestic, 19 to 21%	\$31.00 to \$34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon	
	Per Gross Ton Delivered
50%	\$83.50
75%	130.00
Per Gross Ton Furnace	
10%	\$35.00
11%	37.00
12%	\$39.00
14 to 16%	45.00

Bessemer Ferrosilicon	
	F.o.b. Jackson County, Ohio, Furnace
	Per Gross Ton
10%	\$31.00
11%	33.00
12%	\$35.00

Silvery Iron	
	F.o.b. Jackson County, Ohio, Furnace
	Per Gross Ton
6%	\$24.00
7%	25.00
8%	26.00
9%	27.00
10%	\$29.00
11%	31.00
12%	33.00

Other Ferroalloys	
Ferrotungsten, per lb., contained metal del'd	\$1.35 to \$1.50
Ferrosilicon, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovandium, per lb. contained vanadium, f.o.b. furnace	\$3.15 to \$3.65
Ferrocobalt, 15 to 18%, per net ton, f.o.b. furnace, in carloads	\$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	\$91.00
Ferrophosphorus, electric 24%, f.o.b. Aniston, Ala., per gross ton	\$122.50

Fluxes and Refractories	
Fluorspar	
	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	\$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	\$18.00 to \$18.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/4% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick	
	Per 1000 f.o.b. Works
	High-Heat Intermediate Duty Brick Heavy Duty Brick
Pennsylvania	\$43.00 to \$46.00 \$35.00 to \$38.00
Maryland	43.00 to 46.00 35.00 to 38.00
New Jersey	50.00 to 65.00
Ohio	43.00 to 46.00 35.00 to 38.00
Kentucky	43.00 to 46.00 35.00 to 38.00
Missouri	43.00 to 46.00 35.00 to 38.00
Illinois	43.00 to 46.00 35.00 to 38.00
Ground fire clay, per ton	7.00

Silica Brick	
	Per 1000 f.o.b. Works
Pennsylvania	\$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	\$8.50 to 10.00

Magnesite Brick	
	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	\$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick	
	Per Net Ton
Standard size	\$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts	
	Per 100 Pieces
	(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)
	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.
 †Bolts with rolled thread up to and including 1 1/2 in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts	
	Per Cent Off List
Semi-finished hexagons nuts	70
Semi-finished hexagons castellated nuts, S.A.E.	70
Stove bolts in packages, Pittsburgh	80, 10 and 5
Stove bolts in packages, Chicago	75, 20, 10 and 5
Stove bolts in packages, Cleveland	75, 20 10 and 5
Stove bolts in bulk, Pittsburgh	80, 10, 5 and 2 1/2
Stove bolts in bulk, Chicago	75, 20, 10, 5 and 2 1/2
Stove bolts in bulk, Cleveland	75, 20, 10, 5 and 2 1/2
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55, 60 per cent apply.

Large Rivets	
	(1 1/2-In. and Larger)
	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	\$3.10
F.o.b. Chicago	3.20

Small Rivets	
	(7/8-In. and Smaller)
	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws	
	(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)
	Per Cent Off List
Milled cap screws	80, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85
Upset hex. cap screws, S.A.E. thread	85
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Steel Orders Equal to Best Records of Year—65 Per Cent of Third Quarter Pig Iron Under Contract

CHICAGO, May 21.—Although there are a few scattered influences which might be taken as bearing down on the local steel market, favorable factors are so predominant that the situation as a whole is not materially changed from that of a week ago. Lower price levels for grain, combined with a surplus resulting from two large crops and the favorable outlook for the next crop, are leading to speculation as to the effect on the purchasing power of the farmer, particularly as it may affect manufacturers of farm machinery. At this time farm equipment plants are operating at capacity, with well arranged schedules for some time to come. The nearness of the inventory period, usually from June 1 to early in July, has had no effect on shipments of steel and if the precedent set last year again holds, as some think it will, specifications from this source will be little changed in the early summer months.

From the viewpoint of steel producers, the past week marks a sharp upturn, especially in sales, which were fully equal to the average so far this year. Specifications for finished steel are a trifle heavier than shipments and deliveries stand at 14 weeks for bars and plates, while 10 weeks is now the average on structural material as a result of demands by railroad car builders. In most cases, users have exhausted supplies on hand and their pressure for faster delivery of a wide range of products is adding to the burdens already imposed on mill schedules.

Nonintegrated mills are being held to 85 per cent of capacity because of scarcity of raw steel. There are indications, however, that this situation is less acute, as several sheet mills expect to operate soon at a slightly higher rate, and the producer in southern Illinois has already supplied the bulk of car builders' contracts and is offering more favorable deliveries on plates.

Opening of third quarter books is near at hand. The two-base schedule for blue annealed sheets appears to have been universally adopted by sellers. Prices for hot and cold-rolled strip steel are strong.

Pig Iron.—Shipments of Northern iron by local sellers have been in such volume that a first-half record is assured. Deliveries so far in May compare favorably with the rate maintained in April, and there is every in-

dication that the melt is steady in local foundries. Consumers are freely entering the market for third quarter requirements, and fully 65 per cent of the tonnage normally expected for that period has been placed under contract. Spot sales of fill-in tonnages are numerous and a few buyers have been willing to make commitments for the last half. With stocks low at furnaces, melters do not always find deliveries to their liking. A buyer in Iowa is in the market for 2000 tons for last half shipment. The Southern iron market is dull.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil.	1.75 to 2.25	\$20.00
N'th'n No. 1 fdy., sil.	2.25 to 2.75	20.50
Malleable, not over 2.25 sil.		20.00
High phosphorus		20.00
Lake Super. charcoal, sil.	1.50	27.04
So'th'n No. 2 fdy. (all rail)	\$21.01 to	21.51
Low phos., sil. 1 to 2, copper free		29.50
Silvery, sil. 8 per cent.		30.79
Bess. ferrosilicon, 14-15 per cent.		46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—The event of the week in this market has been the unloading of a boatload of spiegeleisen from England. This market is quiet. Shipments against old orders are heavy.

Prices delivered Chicago: 80 per cent ferromanganese, \$112.56; 50 per cent ferrosilicon, \$83.50 to \$88.50; spiegeleisen, 19 to 21 per cent, \$40.76.

Cast Iron Pipe.—It is doubtful if this market has held even at the sluggish rate of a week ago. There is some prospect of large work coming before the trade in Michigan, but in Illinois and adjoining States there is little of promise for the immediate future. Contractors here are without their usual volume of spring work, and the result is that competition among them is keen. Recent purchases by public utilities have been light, but their specifications have been liberal against contracts placed earlier in the year. Pipe foundries are operating with small backlogs and below their rated capacities. Deliveries are reasonably prompt on a wide range of sizes. Prices remain steady at \$44.20 to \$46.20 a ton, delivered Chicago, for 6-in. and larger diameters. It is reported here that the McWane Cast Iron Pipe Co. has been awarded 21,000 ft. of 6-in. and 8000 ft. of 8-in. Class B pipe by Saint Clair Shores, Mich., and that this seller has taken through a contractor a round

tonnage of 2-in. to 6-in. pipe for Coal City, Ill. Chicago has placed 770 tons of 24-in. pipe with the Glamorgan Pipe & Foundry Co. at \$46.45 a ton, delivered at the trench. Merriman, Neb., will open bids May 23 on 10,000 ft. of 4 to 8-in. pipe.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, \$44.20 to \$46.20; 4-in., \$48.20 to \$50.20; Class A and gas pipe, \$3 extra.

Rails and Track Supplies.—Secondary buying of standard-section rails is dull, 1000 tons having been the total for the week. Rail mills are hard pressed for semi-finished steel and therefore have not been able to hold to shipping schedules as outlined earlier in the year. The result is that the railroads find track laying programs have not made the progress expected, and accordingly interest in additional tonnages is marking time. New business in track accessories totals 3000 tons. Deliveries of most track supplies are satisfactory, as gaged by the current shipment of rails. The light rail market is without feature.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, \$43; light rails, rolled from billets, \$36. **Per lb.:** Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.15c.; angle bars, 2.75c.

Sheets.—Sellers who have adopted the two-base method of quoting blue annealed sheets and who have opened books for the third quarter find buyers willing to consider future needs, but tonnages actually placed are not impressive. The new blue annealed schedule has been adopted by all producers. Specifications balance well with shipments, which represent 80 to 85 per cent of local hot mill capacity. Deliveries range from 60 to 90 days on jobbing mill sizes of sheets and from six to eight weeks on other sizes. Turnover by warehouses is unusually fast.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 3.10c.; No. 24 galv., 3.85c.; No. 10 blue ann'd, 2.35c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Reinforcing Steel.—Sales of bars in the week totaled close to 2500 tons, and fresh inquiry looks more promising. Several projects, long on the pending list, have taken on new life. Small orders are more numerous. Greater activity in the market as a whole not only has checked the decline in shipments from warehouses, but mill output this week shows some improvement. There is little change in the price situation other than more strength in quotations on billet steel. Warehouse stocks are low, partly because of hesitancy by dealers to lay in supplies when faced by a dull spring market and partly because of the mill delivery situation. With business increasing, warehouses are pressing harder for shipments from producers. Olney J. Dean & Co., Chicago, have taken an order for 800 tons of reinforcing mesh for use in the Mercantile Mart.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel	2.10c. to 2.40c.
Reinforc'g bars, rail steel	1.90c. to 2.05c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (½ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.90c.
Blue ann'd sheets (No. 10)	3.35c.
Spikes, ½ in. and larger	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
Per Cent Off List	
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'd wire, per 100 lb.	\$3.45
Com. wire nails, base per keg	3.20
Cement c'd nails, base per keg	3.20

Structural Material.—Backlogs of the larger structural shops in this district are shrinking as a result of the absence of large tonnage lettings. The structural market is said to be unusually dull to the south and west of Chicago, but at Milwaukee fabricators are in a comfortable position. There is some probability that the Frontenac Club will take over the property owned by the LaSalle Club and construct a building which will require about 5000 tons. Demand for shapes by car builders has put deliveries ahead to 10 weeks. This situation is working a hardship on fabricators who have hesitated to build up stocks and who had expected to draw on mills for specific jobs of small tonnage.

Mill prices on plain material, per lb.: 2.05c. to 2.15c. base, Chicago.

Bolts, Nuts and Rivets.—This market is steady. Releases against contracts are at an unchanged rate. Prices are firm on a sizable volume of spot business. Farm implement manufacturers continue to enter liberal specifications, notwithstanding that for many the inventory period is less than two weeks off.

Bars.—Demand for mild steel bars is unabated, and deliveries remain at about 14 weeks. Forgers here are busy, and in some cases are making use of water shipments of steel from Lake Erie ports. Specifications from the automobile trade indicate that the industry is holding close to the production schedules of previous weeks. In some cases schedules, which have been arranged well through July, are being exceeded. Little interest in third quarter requirements of rail steel bars is being shown by users. Sellers, however, are willing to take business for that period at present quotations.

Plates.—Shipments of plates from Chicago mills are steady. Promises of delivery are not better than 14 weeks. Specifications from car builders are heavy and a round tonnage is still to be ordered out. At St. Louis the situation is reported to be somewhat different. There car shops have made known the bulk of their immediate needs and these have been well taken care of by local producers, who are offering more favorable deliveries than a week ago. New car inquiry of interest to Western builders is for 500 underframes for the Fruit Growers' Express. Fresh inquiry for tank tonnage totals 10,000 tons.

Old Material.—Prices for scrap are sinking to lower levels in a market which is characterized by lack of interest on the part of many important buyers. A steel mill has taken a moderate tonnage of heavy melting steel at \$15.75 a gross ton, delivered. This is a drop of 25c., as compared with the previous sale to a large consumer. Numerous other grades have given ground from 25c. to 50c. a ton. Cast iron borings were sold early in the week at \$10.75 a ton, delivered. However, dealers find no trouble in getting supplies at \$10 for delivery against old contracts. As gaged by

shipments, there appears to be an excess of supplies over demands. but rejections are running high and there is little doubt that first grade scrap is scarce. The movement of country scrap into Chicago is heavier, and some dealers point to careless preparation in country yards as the outstanding reason for the bulk of rejections.

Prices deliv'd Chicago district consumers:
Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel.....	\$15.25 to \$15.75
Shoveling steel.....	15.25 to 15.75
Frogs, switches and guards, cut apart, and misc. rails	16.75 to 17.25
Hydraul. compressed sheets	13.50 to 14.00
Drop forge flashings.....	11.00 to 11.50
No. 1 busheling.....	13.50 to 14.00
Forg'd cast and r'd steel carwheels.....	18.75 to 19.25
Railroad tires, charg. box size.....	18.75 to 19.25
Railroad leaf springs cut apart.....	18.75 to 19.25

Acid Open-Hearth Grades:	
Steel couplers and knuckles	17.00 to 17.50
Coil springs.....	19.00 to 19.50
Electric Furnace Grades:	
Axle turnings.....	16.25 to 16.75
Low phos. punchings.....	17.50 to 18.00
Low phos. plates, 12 in. and under.....	16.50 to 17.00

Blast Furnace Grades:	
Axle turnings.....	11.00 to 11.50
Cast iron borings.....	10.00 to 10.50
Short shoveling turnings.....	10.00 to 10.50
Machine shop turnings.....	7.25 to 7.75

Rolling Mill Grades:	
Iron rails.....	16.00 to 16.50
Rerolling rails.....	17.50 to 18.00

Cupola Grades:	
Steel rails less than 3 ft.....	18.50 to 19.00
Steel rails less than 2 ft.....	19.00 to 19.50
Angle bars, steel.....	17.00 to 17.50
Cast iron carwheels.....	14.50 to 15.00

Malleable Grades:	
Railroad.....	18.50 to 19.00
Agricultural.....	15.75 to 16.25

Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.....	26.00 to 31.00

Per Net Ton	
Rolling Mill Grades:	
Iron angles and splice bars	15.00 to 15.50
Iron arch bars and transoms.....	21.50 to 22.00
Iron car axles.....	26.50 to 27.00
Steel car axles.....	17.00 to 17.50
No. 1 railroad wrought.....	14.00 to 14.50
No. 2 railroad wrought.....	13.75 to 14.25
No. 2 busheling.....	7.00 to 7.50
Locomotive tires, smooth.....	14.50 to 15.00
Pipes and flues.....	10.00 to 10.50

Cupola Grades:	
No. 1 machinery cast.....	15.50 to 16.00
No. 1 railroad cast.....	14.50 to 15.00
No. 1 agricultural cast.....	14.00 to 14.50
Stove plate.....	12.75 to 13.25
Grate bars.....	13.00 to 13.50
Brake shoes.....	12.00 to 12.50

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Wire Products.—Movement of wire and wire products in the past week was at an improved rate. The gain is impressive enough to lead sellers to believe that the total shipments for May will come close, if not equal, to the volume in April. This improvement comes principally from more active sales by jobbers and a corresponding increase in business being done by retailers. Demands in rural districts show marked improvement. Unseasonable weather has delayed field work, giving farmers more time for other work. However, as the weather moderates, field work will become of prime importance and a lessened demand for wire products from rural districts can be expected. The demand for nails is somewhat lighter than a week ago. Needs of the manu-

facturing trade for wire are unchanged.

Cold-Rolled Strip.—Sellers of this commodity are considering opening third quarter books within the next week or 10 days. Present prices are strong, and it is intimated in some quarters that serious consideration is being given to higher quotations for the third quarter. Specifications continue to come from a wide circle of users at a rate matching capacity production. The bed manufacturing trade is taking larger quantities of this commodity.

Hot-Rolled Strip.—Output in this district is as near capacity as the supply of raw steel will permit. Specifications are fully equal to shipments. Prices are strong and higher quotations for the third quarter are a possibility.

Coke.—A few buyers have closed for by-product foundry coke for the last half at \$8 a ton, f.o.b. local ovens. Spot sales are in moderate volume. Shipments are holding at a uniform rate.

Commercial Steel Castings in Record Output

WASHINGTON, May 21.—Aggregating 142,522 tons, representing 98 per cent of shop capacity, orders for commercial steel castings in April were the next to highest on record, being exceeded only in March, 1923, with a total of 172,101 tons, according to the Department of Commerce. Production in April set a new high record. It amounted to 118,986 tons, or 82 per cent of capacity. The previous record production was 115,503 tons and was made in March, 1926. April orders exceeded by 11,686 tons those of March, when the total was 130,836 tons.

April orders were distributed as follows: Railroad specialties, 74,425 tons, representing 110 per cent of that class of capacity; miscellaneous castings, 68,097 tons, or 87 per cent of such capacity.

Orders for the four months ended April 30 aggregated 513,310 tons, compared with 350,365 tons for the corresponding period of last year.

Production in April was distributed as follows: Railroad specialties, 52,483 tons, or 78 per cent of such capacity; miscellaneous castings, 66,503 tons, or 85 per cent of that kind of capacity.

Production during the first four months totaled 425,130 tons, against 342,186 tons during the corresponding period of last year.

Youngstown Steel Car Door Co., Cleveland, has purchased a 15-acre site along the Erie Railroad at Youngstown and plans to place a contract shortly for a factory building. The company manufactures steel doors for railroad cars and since its organization two or three years ago has had the doors made by the plant of the Midland Steel Products Co., Cleveland.

New York

Pig Iron Prices Not Strong in Buying Lull—22,500 Tons of Steel Let for Elevated Highway

NEW YORK, May 21.—With pig iron sales totaling only about 6000 tons, there is little evidence of interest in third quarter requirements. Buyers are evidently convinced that nothing will be lost by delaying their purchases. Meanwhile, some producers are more disposed to negotiate with melters on the question of price, and the market is regarded as rather easy at \$18, Buffalo, or the equivalent, for No. 2 plain iron. The lull in buying is a reflection of the waiting attitude of consumers rather than any appreciable reduction in melt. The operations of foundries making heating equipment have been slow for some time. One Eastern radiator plant is idle and another is running part time. Melters in most other fields are active. Aside from a purchase of 1000 tons by the A. P. Smith Mfg. Co. for its Bloomfield, N. J., plant, individual orders for pig iron have been small. Occasional lots of foreign iron are being sold, but importers are not important competitive factors. Prices on foreign metal, in fact, are stiffening, Dutch iron now being quoted at \$22.50, duty paid port of entry, for No. 1X. A boatload of Dutch iron is expected to reach Bridgeport, Conn., the latter part of this month.

Prices per gross ton, delivered New York district:

Buffalo No. 2, fdy., sil.	1.75 to 2.25	\$22.91 to \$23.91
*Buf. No. 2, del'd east.		
N. J.	21.28 to 22.28	
East. Pa. No. 2 fdy., sil.	1.75 to 2.25	21.39 to 22.52
East. Pa. No. 2X fdy., sil.	2.25 to 2.75	21.89 to 23.02

Freight rates: \$4.91 from Buffalo, \$1.39 to \$2.52 from eastern Pennsylvania.

*Price delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

Ferroalloys.—Occasional small lots of spiegeleisen, together with some contracts of fair size, are noted at unchanged prices. Imports for the first quarter of this year have been heavy and total almost as much as was brought in during all of 1928. There have also been sales of carload and small lots of ferromanganese for fairly early delivery. Specifications on contract for these alloys as well as for ferrosilicon and ferrochromium continue insistent.

Reinforcing Bars.—The threat of a lockout in the local building trades is no longer taken seriously. Lettings are in fair volume, and the outlook for the immediate future is satisfactory.

Billet steel reinforcing bars in 40, 50 and 60-ft. lengths, 2.05c. per lb., Pittsburgh, and 2.30c. per lb., Pittsburgh warehouse, for cut lengths. Out of New York warehouse, 2.90c. per lb. for lots of 5 tons or more, 3.05c. for lots of 2 to 5 tons and 3.30c. for less than 2 tons, all delivered at job.

Finished Steel.—Structural steel orders, which were unusually heavy during the past week, included 22,500 tons for the West Side elevated highway, to be furnished by the Fort Pitt

Bridge Works, and 6600 tons for the Hotel Pierre, Fifth Avenue and Sixtieth Street. The Baltimore & Ohio Railroad has ordered 4000 all-steel freight cars, about half of which, it is expected, will be built in Eastern shops and the other half in the Pittsburgh district. Shipbuilding prospects are more promising. The Dollar Line is figuring on four boats which will take nearly 50,000 tons of steel. New steel business and specifications against contracts have declined, but shipments to consumers and jobbers in this district are holding up to the recent level. A sidelight is the statement of a local steel company office that its telegraph bills have doubled in the past few weeks, reflecting the efforts of buyers to hurry up shipments. Such a situation probably means that steel is being used very quickly after receipt and that little, if any, stocks are being built up. Within the next week or two the mills will receive specifications against June contract quotas for plates, shapes and bars. Some sheet buyers have already specified their June requirements.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.29c.; plates, 2.22½c.; structural shapes, 2.19½c.; bar iron, 2.14c.

Warehouse Business.—Buying from stock has increased slightly since the early part of the month, so that May is expected to compare favorably with April. Consumers of galvanized sheets are particularly active buyers, as they are unable to secure early delivery from the mills. Concessions are still being made on desirable orders for structural material and sheets.

Cast Iron Pipe.—Buying continues on a smaller scale than usual and prices are irregular. Some substantial business for export is in the market from the Government of the Philippines. In addition to the previously reported inquiry for about 1500 tons of pipe on which bids will be opened June 1, with alternate bids on steel pipe, the Government of the Philippines opens bids May 27 on 150 tons of cast iron pipe and fittings, alternate bids on steel pipe, and on June 3 opens bids on about 10,000 tons of 4 to 36-in. bell and spigot pipe and fittings, with no alternate bids asked on steel pipe.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, \$35.60 to \$36.60; 4-in. and 5-in., \$38.60 to \$39.60; 3-in., \$45.60 to \$46.60. Class A and gas pipe, \$3 extra.

Coke.—A leading producer of beehive coke opened its books for last half contracts on May 15. A New England producer of by-product foundry coke is entering into contracts for the rest of this year and a West Virginia producer has completely sold up for the second half. Standard furnace coke is quiet at \$2.75 to \$2.85 per net ton, Connellsville. Special brands of

beehive coke continue at \$4.85 per net ton, ovens, or \$8.56, delivered to northern New Jersey, Jersey City and Newark, and \$9.44 to New York and Brooklyn. By-product coke is quoted at \$9 to \$9.40 per net ton, Newark or Jersey City, and \$10.06, New York or Brooklyn.

Old Material.—Consumer buying is still small and the few dealers shipping No. 1 heavy melting steel to eastern Pennsylvania consumers are

Warehouse Prices, f.o.b. New York

Base per Lb.	
Plates and structural shapes.....	3.30c.
Soft steel bars, small shapes.....	3.25c.
Iron bars.....	3.24c.
Iron bars, Swed. charcoal.....	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons.....	3.60c.
Flats and squares.....	4.10c.
Cold-roll. strip, soft and quarter	
hard.....	5.15c. to 5.40c.
Hoops.....	4.25c.
Bands.....	3.75c.
Blue ann'l'd sheets (No. 10).....	3.85c. to 3.90c.
Long terme sheets (No. 24).....	5.80c.
Standard tool steel.....	12.00c.
Wire, black annealed.....	4.50c.
Wire, galv. annealed.....	5.15c.
Tire steel, 1½ x ½ in. and larger.....	3.30c.
Smooth finish, 1 to 2½ x ¼ in.	
and larger.....	3.65c.
Open-hearth spring steel, bases,	
4.50c. to 7.00c.	
Per Cent Off List	
Machine bolts, cut thread:	
¾ x 6 in. and smaller.....	.60
1 x 30 in. and smaller.....	.50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller.....	.60
¾ x 20 in. and smaller.....	.50 to 50 and 10
Coach screws:	
½ x 6 in. and smaller.....	.60
1 x 6 in. and smaller.....	.50 to 50 and 10
Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.....	\$17.33
Seamless steel, 2-in.....	20.24
Charcoal iron, 2-in.....	25.00
Charcoal iron, 4-in.....	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
½-in. butt.....	46	29
¾-in. butt.....	51	37
1-3-in. butt.....	53	39
2½-6-in. lap.....	48	35
7 and 8-in. lap.....	44	17
11 and 12-in. lap.....	37	12
Wrought Iron—		
½-in. butt.....	5	+19
¾-in. butt.....	11	+9
1-1½-in. butt.....	14	+6
2-in. lap.....	5	+14
3-6-in. lap.....	11	+6
7-12-in. lap.....	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box...	\$6.45	\$6.20
Charcoal, per Box—	A	AAA
IC.....	\$9.70	\$12.10
IX.....	12.00	14.25
IXX.....	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating.....	\$10.00 to \$11.00
IC—30-lb. coating.....	12.00 to 13.00
IC—40-lb. coating.....	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

Per Lb.	
Nos. 18 to 20.....	3.80c.
No. 22.....	3.95c.
No. 24.....	4.00c.
No. 26.....	4.10c.
No. 28*	4.25c.
No. 30.....	4.50c.

Sheets, Galvanized

Per Lb.	
No. 14.....	4.40c.
No. 16.....	4.25c.
No. 18.....	4.40c.
No. 20.....	4.50c.
No. 22.....	4.60c.
No. 24.....	4.75c.
No. 26.....	5.00c.
No. 28*	5.25c.
No. 30.....	5.65c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

offering only \$16 per ton, delivered, a reduction of 50c. a ton. Users have been receiving substantial tonnages of steel on old contracts and distress shipments and are in no apparent need of immediate supplies through new contracts. Machine shop turnings are quiet and brokers are only offering \$11 per ton, delivered, a reduction of 50c. a ton. Dealers' buying prices on forge fire are also off about 50c.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	\$12.50 to \$13.25
Heavy melting steel (yard)	8.25 to 9.25
No. 1 hvy. breakable cast	11.25 to 12.00
Stove plate (steel works)	8.50 to 8.75
Locomotive grate bars	8.75 to 9.00
Machine shop turnings	7.25 to 7.50
Short shoveling turnings	7.25 to 7.50
Cast borings (blast furn. or steel works)	7.00 to 7.25
Mixed borings and turnings	6.75 to 7.00
Steel car axles	19.25 to 19.75
Iron car axles	25.00 to 26.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	11.75
Forge fire	9.50 to 10.00
No. 1 railroad wrought	12.50 to 13.00
No. 1 yard wrought, long	11.50 to 12.00
Rails for rolling	13.00 to 13.50
Cast iron car wheels	12.00 to 12.25
Stove plate (foundry)	9.00 to 9.50
Malleable cast (railroad)	14.00 to 14.50
Cast borings (chemical)	10.50 to 11.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	\$17.00
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size	15.00
No. 2 cast (radiators, cast boilers, etc.)	14.50

Railroad Equipment

Baltimore & Ohio Orders 4000 Cars; Week's Total 4750

FOLLOWING a dull period of some weeks, railroad car buying has been in large volume, totaling 4750 cars, of which the Baltimore & Ohio ordered 4000. With this business settled, the amount of buying in prospect has been considerably reduced, the total in sight not exceeding a few thousand cars. Details of the week's business follow:

Baltimore & Ohio has ordered 4000 all-steel freight cars, which were divided as follows: 1000 box and 1000 hopper cars to Standard Steel Car Co., 1000 gondola cars to American Car & Foundry Co., 1000 hopper cars to Bethlehem Steel Corporation.

Chicago & Alton will repair 130 box cars in its own shops.

Pennsylvania is inquiring for 25 horse-express cars.

New York, New Haven & Hartford is inquiring for 15 baggage-mail cars.

Nickel Plate has ordered 500 box cars from Standard Steel Car Co. and 250 gondola cars from American Car & Foundry Co.

Chicago, Indianapolis & Louisville has ordered 10 Mikado type locomotives from American Locomotive Co.

Calumet & Hecla Consolidated Copper Mining Co. has purchased one locomotive from American Locomotive Co.

Fruit Growers Express is inquiring for 500 steel underframes for refrigerator cars.

Total apparent consumption of Babbitt metal in April was 6,046,445 lb., compared with 6,465,613 lb. in March and with 4,842,656 lb. in April, 1928, according to reports to the Department of Commerce from 31 firms.

Cleveland

Steel Tonnage Entered This Month Will Fall Below April Total—Automotive Orders Show Moderate Decline

CLEVELAND, May 21.—The volume of steel business fell off slightly the past week and the tonnage entered this month will run somewhat below that of April. However, consumers are specifying quite freely for steel bars, plates and structural material for June shipment and no improvement is reported in deliveries of these products. Orders from the automotive industry show a moderate decline, which has caused a further easing up in the delivery situation on auto body sheets and a partial catching up by some of the mills on hot and cold-rolled strip. The demand for alloy steel bars has declined materially, but mills still have comfortable backlogs. Most sheet mills have enough business on their books to keep them operating five weeks or longer. The curtailment in the automotive industry is by no means general, but is being effected by some of the motor car companies that either have large stocks of cars in dealers' hands or are preparing to bring out new models.

Mills look for some revival from the present lull in the demand from the automotive field as soon as motor car builders are ready to place orders for material for new models and July production.

Present prices on sheets have been reestablished for the third quarter, except on blue annealed sheets in lighter gages, which are advanced \$1 to \$2 a ton, depending on the gage, under the new classification which has been generally adopted. The present 2.65c. base has been reestablished for the third quarter on alloy steel bars, but alloy steel billets under 4 x 4 in. and 12 to 16-in. slabs have been put on a steel bar base, with the regular steel bar extras, which results in a price advance. Indications are that present prices will be reestablished on steel bars, plates and structural material and hot and cold-rolled strip.

Activity in the structural field is still rather light. Fabricators are placing some stock orders for plain material.

Prices are steady at 1.95c. to 2c., Cleveland, for steel bars and 1.95c., Pittsburgh, for plates and structural material.

Pig Iron.—Sales are still being made in rather moderate volume. These are about equally divided between early shipment and third quarter business. No general interest is being taken as yet in the coming quarter. Some of the Michigan automobile companies are now asking foundries for quotations on castings for the last half and this may help to arouse interest in third quarter buying. Sales by Cleveland interests during the week totaled 15,000 tons. Prices are unchanged. The lower price on Southern foundry iron has to some extent made it a competitor of Northern iron in sections of southern Ohio, where the former can now be delivered at about the same price as the latter. The local market shows a firmer tone in sections where Cleveland furnaces had been making some concessions from their \$18.50 price to meet the competition of Valley foundry iron, and local furnaces now apparently are holding closely to their \$18.50 price. For Cleveland delivery, the market is firm at \$19,

furnace, for foundry and malleable grades. Other Lake furnaces quote foundry and malleable iron at \$19. In Michigan, there is a range of \$20 to \$20.50 on both grades, depending on shipping point. May shipments are in practically the same volume as in April. Furnaces are shipping all the iron they are making and their stocks remain low.

Prices per gross ton at Cleveland:

N'th'n fdy., slt. 1.75 to 2.25	\$19.50
S'th'n fdy., 1.75 to 2.25	\$21.00 to 21.50
Malleable	19.50
Ohio silvery, 8 per cent.	29.00
Basic Valley furnace	18.50
Stand. low phos., Valley	26.50 to 27.00

Prices except on basic and low phosphorus are delivered Cleveland. Freight rates: 50c. from local furnaces; \$3 from Jackson, Ohio; \$6 from Birmingham.

Iron Ore.—Consumption of Lake Superior ore during April amounted to 5,417,491 tons, a decrease of 47,524 tons, as compared with March. The daily rate of consumption was greater than in March, the decrease being due to the shorter month. The amount consumed in April last year was 4,781,205 tons. Ore at furnaces May 1 totaled 12,283,355 tons. The amount at furnaces and at Lake Erie docks May 1 was 15,929,901 tons, as compared with 19,570,181 tons on the same date a year ago. Central District furnaces in April consumed 2,806,295 tons, a gain of 3675 tons for the month. Eastern furnaces used 89,987 tons, a decrease of 6885 tons. Lake front furnaces consumed 2,404,450 tons, a decrease of 42,243 tons and all-rail furnaces melted 116,759 tons, a decrease of 2071

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex.	3.65c.
Cold-fin. flats and sq.	4.15c.
Hoops and bands, No. 12 to 1/4 in. inclusive	3.25c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	5.95c.
Black sheets (No. 24)	3.70c. to 3.90c.
Galvanized sheets (No. 24)	4.60c. to 4.75c.
Blue ann'd sheets (No. 10)	3.25c.
No. 9 ann'd wire, per 100 lb.	\$2.95
No. 9 gal. wire, per 100 lb.	3.40
Com. wire nails, base per keg	2.95

*Net base, including boxing and cutting to length.

tons. There were 184 furnaces in blast using Lake ore April 30, an increase of one for the month.

Sheets.—Present prices of 2.95c., Pittsburgh, on black, 3.70c. on galvanized and 4.10c. on automobile body sheets have been reestablished for the third quarter by the American Sheet & Tin Plate Co. and by several independent mills. That company, as well as practically all the independent mills, have adopted the new classification on blue annealed sheets, making 2.20c. for Nos. 9 and 10 the base for No. 12 and heavier and 2.35c. for No. 13 the base for that gage and lighter. While the blue annealed prices are effective at once, they will have little application until the third quarter, as consumers are covered by contracts. The American Sheet & Tin Plate Co. has reaffirmed for the third quarter the present 3c. price on tin mill black plate, as well as other prices on tin mill products. The delivery situation on automobile body sheets continues to improve because of a lessened demand from the automotive industry. Some of the mills can also make better deliveries than recently on finished black sheets. Shading to 3.60c. on galvanized sheets is still in evidence.

Strip Steel.—The demand for both hot and cold-rolled strip is not quite so heavy as recently. Deliveries with some mills have improved, but others show no change. Some consumers, particularly of hot-rolled strip, are anxious to close third quarter contracts, and it is expected that prices will be named this week and that 1.90c. for wide and 2c. for narrow hot-rolled strip and 2.75c. minimum for cold-rolled material will be reestablished. Some third quarter business in both hot and cold-rolled material has been taken, subject to prices to be named.

Semi-finished Material.—Demand is holding up to recent volume. While deliveries by a local mill show little improvement, customers' requirements are being well taken care of. Shipments are all against second quarter contracts at \$35 for sheet bars and \$34 for billets and slabs. Reestablishment of sheet prices for the third quarter is expected to lead to considerable resistance to the recent advance on sheet bars.

Wire Products.—Wire is moving in very good volume and is firm at 2.50c., Cleveland. Nails are fairly active. While the local market appears to be holding to \$2.65 per keg, some buyers are still getting shipments against first quarter contracts at lower prices.

Warehouse Business.—Demand is good for all products and sales show a gain over those of April. Recently adopted quantity differentials are not being firmly maintained on sheets, 4.75c. being shaded for less than 25 bundles. Other prices are firm.

Alloy Steel.—Alloy steel manufacturers have reaffirmed the present

2.65c. mill base for alloy steel bars for the third quarter and have placed square billets under 4 x 4 in. on a steel bar base with the regular steel bar extras. Heretofore square billets under 4 x 4 in. down to and including 2½-in. squares have carried a price of \$5 per gross ton above the 4 x 4-in. billet price. Slabs with a sectional area under 16 sq. in. will also hereafter carry the bar price. Heretofore slabs of 12 to 16 sq. in. have carried a \$5 gross ton extra above the billet price. Under the changes, sections smaller than 4 x 4 in. will no longer be classed as billets, as this designation is now regarded as a misnomer, in view of the fact that present exacting requirements of customers require the rerolling of these sections. Computed on a gross ton basis, the effect of the change will be an advance of about \$2.50 to \$6 a ton on bar sections that come under the changed classifications.

Coke.—New demand for foundry coke is moderate. Specifications against contracts are fair. Prices are unchanged. Ohio by-product foundry coke is quoted at \$8.25, Painesville.

Old Material.—The market shows a weak tendency and is inactive. Prices on ordinary No. 1 heavy melting steel have been reduced about 25c. a ton for shipment to one Cleveland mill, but this consumer's ship-

ments are so restricted that dealers are not buying material against their outstanding orders. Selected No. 1 heavy melting steel is quoted at \$16.50 for delivery to another Cleveland mill. Dealers are paying \$18 for heavy melting steel and \$17.25 for compressed sheet steel for Youngstown delivery. Machine shop turnings and low phosphorous scrap are lower. Cast scrap continues firm.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades		
No. 1 heavy melting steel.	\$15.25 to	\$15.75
No. 2 heavy melting steel.	15.00 to	15.50
Compressed sheet steel....	15.00 to	15.50
Light bundled sheet		
stampings	12.00 to	12.50
Drop forge flashings.....	13.00 to	13.25
Machine shop turnings....	9.50 to	9.75
No. 1 railroad wrought....	13.50 to	14.00
No. 2 railroad wrought....	16.00 to	16.50
No. 1 busheling.....	12.50 to	13.00
Pipes and flues.....	9.00 to	9.50
Steel axle turnings.....	12.50 to	13.00
Acid Open-Hearth Grades		
Low phos., forging crops..	17.75 to	18.00
Low phos., billet, bloom		
and slab crops	18.50 to	18.75
Low phos. sheet bar crops.	18.00 to	18.50
Low phos. plate scrap....	18.00 to	18.50
Blast Furnace Grades		
Cast iron borings.....	11.25 to	11.50
Mixed borings and short		
turnings	11.25 to	11.50
No. 2 busheling.....	11.25 to	11.50
Cupola Grades		
No. 1 cast.....	17.25 to	17.50
Railroad grate bars.....	11.00 to	12.00
Stove plate	12.00 to	12.50
Rails under 3 ft.....	16.75 to	17.25
Miscellaneous		
Railroad malleable	16.00 to	16.50
Rails for rolling.....	16.25 to	16.50

Philadelphia

Shipbuilding Contracts Will Take Large Steel Tonnage— Indian Pig Iron Again Arriving

PHILADELPHIA, May 21.—Action initiated by the Inland Steel Co., Chicago, in establishing two bases on blue annealed sheets is to be followed generally by other sheet producers on third quarter contracts. One eastern Pennsylvania mill has applied it on current orders. Slackening in buying by the automobile manufacturers is irregular; plants executing contracts with the Ford and Chevrolet companies continue in full operation, while producers under contract for body building or parts with some other motor companies are buying considerably less material than in the first quarter and the early part of the present quarter. Most eastern Pennsylvania mills are sufficiently well engaged to maintain present operations well into July. Shipbuilding contracts just awarded or pending will take a large tonnage of steel.

Bars.—Deliveries are still rather extended and prices are firmly maintained at 1.95c. per lb., Pittsburgh, or 2.27c., delivered Philadelphia. Mills operating on bar contracts from automobile manufacturers report no slackening in specifications.

Pig Iron.—Furnaces have substantial backlogs and consumers are accepting full shipments against contracts. Demand for foundry iron has improved in the past week, with some inquiries ranging up to 500 tons or more. Arrivals of foreign iron were larger last week than for some time, with 2312 tons of low phosphorus from Great Britain and 1175 tons of foundry iron from India. The cargo of Indian pig iron was the first arrival in more than two months, the furnace there having been out of blast for repairs. No basic sales have been

made lately, but eastern Pennsylvania consumers are expected to inquire for third quarter requirements in the next two or three weeks.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to	
2.25 sil.	\$21.76 to \$22.26
East. Pa. No. 2X, 2.25 to	
2.75 sil.	22.26 to 22.76
East. Pa. No. 1X.....	22.76 to 23.26
Basic (del'd east. Pa.)....	20.25 to 21.00
Gray forge	20.50 to 21.00
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b.	
N. Y. State furnace)....	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b.	
furnace)	23.50 to 24.00
Va. No. 2 plain, 1.75 to	
2.25 sil.	24.79
Va. No. 2X, 2.25 to 2.75 sil.	25.29

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

Reinforcing Bars.—The largest award here in the past week was 300 tons of billet steel bars for the Rey-

burn Building, Philadelphia, which was placed with the Truscon Steel Co. Billet steel reinforcing bars in 40, 50 and 60-ft. lengths are quoted at 2.05c., Pittsburgh, or 2.37c., Philadelphia, with a \$5 extra for cutting to length. Occasionally eastern Pennsylvania sellers have quoted billet steel bars at 1.95c., Pittsburgh, and \$5 extra for cutting. Rail steel bars are 1.95c., f.o.b. Franklin, Pa., or Tonawanda, N. Y., cut to required length, or 2.27c., delivered Philadelphia.

Shapes.—Mills are as well engaged as at any time this year, but shape prices continue irregular, with 1.95c. to 2c., f.o.b. nearest mill to consumer, generally quoted, or 2.01c. to 2.06c., delivered Philadelphia. Slightly lower than 1.95c., mill, is occasionally quoted on desirable business. Except for some substantial bridge construction and steel for electrification work on the Pennsylvania and Reading railroads, fabricated steel business is small.

Plates.—Following formal award of ships for the Robert Dollar Line and the Export Steamship Corporation, the New York Shipbuilding & Dry Dock Co., Camden, N. J., is expected to be in the market for upward of 25,000 tons of plates. The Newport News Shipbuilding & Dry Dock Co. is also a potential buyer of plates for ships for which the formal contract has not yet been given. The price of plates is maintained at 2.05c., Coatesville, or 2.15c., Philadelphia, and most mills are sufficiently well occupied to assure the present rate of operation into the third quarter.

Sheets.—The usual seasonal increase in activity by radio manufacturers is bringing some desirable business to the mills, but in certain instances there has been a slight decline in buying by automobile manufacturers. Producers of blue annealed sheets are in most cases preparing to apply the two bases recently announced by the Inland Steel Co. Prices are being maintained better than for some time, only oc-

casional concessions being reported to large consumers. Blue annealed sheets are quoted at 2.10c. to 2.20c. per lb., Pittsburgh, or 2.42c. to 2.52c., delivered Philadelphia, black at 2.95c. Pittsburgh, or 3.27c., Philadelphia, and galvanized at 3.70c., Pittsburgh, or 4.02c., Philadelphia.

Warehouse Business.—Buying has been increasing, following a lull early this month. Shading is still reported on desirable orders for structural material and sheets.

Imports.—In the week ended May 18, a total of 6750 tons of Algerian iron ore arrived at this port and 3663 tons of pig iron. The pig iron consisted of 2312 tons from the United Kingdom, 1175 tons from British India and 176 tons from Norway. Steel imports consisted of 163 tons of structural shapes, 122 tons of steel bars and one ton of steel hoops from Belgium, 26 tons of iron bars, 14 tons of steel billets and 71 tons of steel bars from Sweden, 25 tons of steel hoops, 10 tons of galvanized steel strips and three tons of structural shapes from the United Kingdom, and 22 tons of steel scrap from Germany.

Old Material.—Consumer buying is still limited, and, with an increasing tonnage of all grades of scrap coming into the market, prices show a decided downward trend. Stove plate has been sold at \$12.50 per ton, delivered, and No. 2 steel at \$13 per ton, delivered to a Phoenixville, Pa., consumer. No. 1 blast furnace scrap continues unchanged, with small sales at \$10.50 per ton, delivered Swedeland, Pa., and \$11 per ton, delivered Coatesville, Pa. Consumers of No. 1 heavy melting steel have received heavy tonnages on old contracts in the past fortnight, and one user is reported to have received a fair tonnage of steel by barge and rail shipment, so that early contracting is not expected.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel.	\$16.50
Scrap T rails.	16.00
No. 2 heavy melting steel.	\$13.00 to 14.00
No. 1 railroad wrought.	16.00 to 16.50
Bundled sheets (for steel works)	11.50
Hydraulic compressed, new	14.50 to 15.50
Hydraulic compressed, old.	12.00 to 12.50
Machine shop turnings (for steel works)	11.50
Heavy axle turnings (or equiv.)	14.50 to 15.00
Cast borings (for steel works and roll. mill)	11.00 to 11.50
Heavy breakable cast (for steel works)	15.50
Railroad grate bars.	12.50 to 13.00
Stove plate (for steel works)	12.50 to 13.00
No. 1 low phos., hvy., 0.04% and under.	22.00 to 23.00
Couplers and knuckles.	20.00 to 21.00
Rolled steel wheels.	20.00 to 21.00
No. 1 blast f'nce scrap.	10.50 to 11.00
Wrot. iron and soft steel pipes and tubes (new specific.)	15.50
Shafting	19.00 to 19.50
Steel axles	23.00 to 23.50
No. 1 forge fire.	14.00
Cast iron carwheels.	16.50
No. 1 cast.	16.50 to 17.00
Cast borings (for chem. plant)	15.00
Steel rails for rolling.	16.50 to 17.00

Warren to Build Pipe Plant at Everett, Mass.

Obstacles encountered by the Warren Foundry & Pipe Co. in connection with its proposed pipe foundry at Everett, Mass., have been overcome, and final plans are under consideration for starting construction. It is practically assured the new plant will be in operation next fall. The Mystic Iron Works will furnish pig iron and the New England Coal & Coke Co. fuel to the pipe foundry. City officials of Everett last week were the guests of the Warren Foundry & Pipe Co. at its New Jersey plant.

There is considerable speculation regarding the possibility of the Intercontinental Metal Pipe & Mining Co. erecting a pipe foundry in Chelsea, Mass., in close proximity to land upon which the Warren Foundry & Pipe Co. plant will be built. Stone & Webster, Inc., has been engaged as engineer to make plans and estimate the cost of a Chelsea plant and Herbert Kennedy, president of the Intercontinental Metal Pipe & Mining Co. stated last week that a plant of 150,000 tons annual capacity and employing 600 men is to be built. In banking circles it is stated that the question of a Chelsea plant rests on the ability of the company to market certain securities.

Reduction in Wholesale Commodity Prices

Commodity prices in April were given an index number of 96.8, compared with 97.5 in March, by the United States Bureau of Labor Statistics. These two figures compare with 97.4 in April, 1928. Among the items showing a drop from the March figure, farm products made the greatest reduction. Nearly all of the other groups showed fractional declines, the only one going up, and that by a mere fraction, being house-furnishing goods.

The metal and metal products group and the fuel and lighting group showed no change from March. Metals are at 106.4, which is 8 units higher than a year ago. This is attributable very largely to a change in the level of non-ferrous prices, this being 113.1 against 91.3 last year. Iron and steel have gone up from 95.1 to 98.2 in that period; automobiles from 104.3 to 112.2, and miscellaneous metal products from 96.9 to 98.5. Agricultural implements have stood at 98.8 for all three of the months under survey.

Building materials are higher than a year ago, having gone up to 97.9 from 92.5 last year. This is because of large increases in the lumber component and in the miscellaneous item. There have been decreases in brick and cement, structural steel has stood at 97 over the whole period and a fractional increase was registered in paints.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, 1/4-in. and heavier.	2.70c.
Plates, 3/8-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1 1/2 x 1 1/2 in.	3.50c.
Round-edge steel, planished.	4.30c.
Reinforc. steel bars, sq. twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.60c.
Cold-fin. steel, sq. and flats.	4.10c.
Steel hoops	3.40c.
Steel bands, No. 12 to 1/4-in., inclus.	3.15c.
Spring steel	5.00c.
*Black sheets (No. 24).	4.10c.
†Galvanized sheets (No. 24).	4.85c.
Blue ann'd sheets (No. 10).	3.25c.
Diam. pat. floor plates—	
1/4-in.	5.30c.
3/8-in.	5.50c.
Rails	3.20c.
Swedish iron bars.	6.60c.

*For 50 bundles or more: 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more: 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Pacific Coast

Steel Demand Continues Fairly Active—3000 Tons in Transmission Towers Awarded—Prices Are Steady

SAN FRANCISCO, May 18.—(By Air Mail)—Continuation of fairly heavy demand for most forms of steel, together with the award of three transmission tower projects, calling for more than 3000 tons of light structurals, marked the iron and steel situation on the Pacific Coast markets this week. The price structure is now on a fairly even keel, with a stronger tone in the out-of-stock prices on reinforcing steel bars in the San Francisco and Los Angeles districts.

Pig Iron.—Demand for foundry iron has shown little improvement during the past few weeks. Prices have not changed.

Prices per gross ton at San Francisco:

*Utah basic	.....	\$25.00 to \$26.00
*Utah fdy., sil.	2.75 to	
3.25	.....	25.00 to 26.00
**Indian fdy., sil.	2.75 to	
3.25	.....	25.00 to 26.00

*Delivered San Francisco.

**Duty paid, f.o.b. cars San Francisco.

Bars.—The largest reinforcing bar contract of the week involved 1000 tons for bins at Seattle for the Fisher Flouring Co. and was placed with the Pacific Coast Steel Co. A paving project in Siskiyou County, Cal., went to an unnamed interest. Truscon Steel Co. booked 185 tons for a baking plant in San Francisco. Pending business exceeds 6000 tons and includes 2550 tons for the Cushman dam project at Tacoma. Out-of-stock prices in San Francisco and Los Angeles continue fairly firm at 2.20c., base, on lots of 250 tons or more, 2.30c. on carload lots and 2.60c. on less-carload business. Merchant bar material is quoted at 2.35c., c.i.f.

Plates.—The Pittsburgh-Des Moines Steel Co. secured 1200 tons for a 96-in. siphon for the Belle Fourche project in South Dakota, bids on which were opened in Denver, Colo. The Puget Sound Machinery Depot, Seattle, placed 200 tons of plates with an unnamed Eastern mill for a boiler. Bids were opened this week on 575 tons of 5/16-in. plate for a 24-in. welded steel pipe line for Los Angeles, on which the Western Pipe & Steel Co. was low bidder. Bids will be called for at once for the Diablo power tunnel at Seattle, requiring 500 tons of steel. Prices remain around 2.35c., c.i.f.

Warehouse Prices, f.o.b. San Francisco

Base per Lb.	
Plates and struc. shapes	..... 3.15c.
Soft steel bars	..... 3.15c.
Small angles, 3/8-in. and over	..... 3.15c.
Small angles, under 3/8-in.	..... 3.55c.
Small channels and tees, 3/4-in. to 2 3/4-in.	..... 3.75c.
Spring steel, 1/4-in. and thicker	..... 5.00c.
Black sheets (No. 24)	..... 4.90c.
Blue ann'd sheets (No. 10)	..... 3.80c.
Galv. sheets (No. 24)	..... 5.30c.
Struct. rivets, 1/2-in. and larger	..... 5.65c.
Com. wire nails, base per keg	..... \$3.40
Cement c'd nails, 100 lb. keg	..... 3.40

Shapes.—A large number of structural shape projects were placed during the week, the total having been in excess of 7300 tons. The Emsco Derrick & Equipment Co., Los Angeles, this week booked an order for galvanized steel transmission towers, requiring 2000 tons of steel, for the Southern California Edison Co. The Pacific Coast Steel Co. took 1500 tons for a transmission tower line for the Brazilian Hydro-electric Co., Rio de Janeiro, through the Canadian General Finance Co. of Toronto, Ont., and 275 tons for towers and a bus structure for the Puget Sound Light & Power Co., Renton, Wash. The Hofius Steel & Equipment Co. secured 1000 tons for the Fisher Body Co. plant in Seattle and 300 tons for a power house at Renton, Wash. The McClintic-Marshall Co. took 250 tons for an addition to a telephone building in San Diego. Bids were opened this week on 935 tons for pier shed No. 48, San Francisco. Plain structural material is firm at 2.35c., c.i.f.

Cast Iron Pipe.—Among the awards this week were 900 tons for

the Weyerhaeuser Timber Co., Klammath Falls, Ore., 150 tons for Victoria, B. C., and 100 tons for Puyallup, Wash., and Lewiston, Idaho, all booked by the American Cast Iron Pipe Co. Bids have been opened on 224 tons of 12-in. Class D pipe for the improvement of West Lake Avenue North, Seattle. Yuba City Cal., will open bids on May 28 for 104 tons. San Diego will open bids on June 3 for 117 tons of 4 to 10-in. Class C pipe. Bids have been opened on 338 tons of 4 to 12-in. Class B pipe for Southgate, Cal. Sierra Madre, Cal., recently opened bids on 819 tons of 4 to 16-in. Class 150 pipe but purchased electrically welded steel and lapwelded steel pipe.

Steel Pipe.—The Southern Counties Gas Co., Los Angeles, has placed with unnamed interests 1348 tons of 6 1/2-in. line pipe for installation near Paso Robles. The Crane Co. secured 288 tons of 5 to 14-in. welded seamless steel tubing for Sierra Madre, Cal. The Western Pipe & Steel Co. submitted the low bid on 575 tons of 24-in. lapwelded or electrically welded steel pipe for Los Angeles. Bids open on June 4 on 142 to 180 tons of 8 or 10-in. standard black pipe for the La Canada Irrigation District, La Canada, Cal. Los Angeles is also in the market for 195 tons of 24 in. lapwelded steel pipe, bids on which will be opened May 21.

Birmingham

Steel Business Sustained, With No Signs of Slackening—Pig Iron Shipments Less Than Output

BIRMINGHAM, May 21.—Pig iron continues to sell in small to moderate-sized lots for immediate requirements, but the total volume is unsatisfactory to the furnaces. No noticeable improvement is reported in the melt. Furnace interests still find it difficult to ship all of the current make. No interest has been shown in third quarter iron. Carriers are working out a proposed downward revision of rates from Birmingham on water and rail shipments to Coast points and rail shipments to the Middle West. Nine furnaces are on foundry iron, seven on basic and one on recarburizing, a total of 17.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	..... \$15.00 to \$15.50
No. 1 fdy., 2.25 to 2.75 sil.	..... 15.50 to 16.00
Basic	..... 15.00 to 15.50

Finished Steel.—New business in the past week is estimated to equal that of the best weeks this year, and sales officials report no indications of a slackening in the near future. All lines are sharing in the activity, with the single exception of steel rails. Prices are of very little issue in the situation. Operations of some of the structural steel fabricating shops are the best in the history of the companies, but business in prospect will not support opera-

tions at the present rate. New orders for the Ingalls Iron Works Co. include 635 tons for the United States Phosphoric Products Corporation and 540 tons for a new store for the S. H. Kress Co., both of Tampa, Fla. Reinforcing bar business is fair. The Connors Steel Co. has booked orders for 480 tons for the Merchants Bank & Trust Co. building at Jackson, Miss., and 150 tons for a high school at Little Rock, Ark. Twenty open-hearths are active, the same as in the previous week.

Cast Iron Pipe.—Pressure pipe manufacturers report a better inquiry from municipalities, but buying has not yet improved. Plants will have to curtail operations shortly unless there is considerable improvement in awards. The National Cast Iron Pipe Co. has secured an order for 912 tons for Pampico, Mex. The United States Pipe & Foundry Co. booked an order for 30,000 ft. of 6-in. pipe for a project at Nashville, Tenn. A new order of the American Cast Iron Pipe Co. is for 217 tons for Aruba, Dutch West Indies. Pewaukee, Wis., has placed an order with the McWane Cast Iron Pipe Co. for 350 tons. Most of the sales have been in lots of less

than 100 tons. Vaiden, Miss., will open bids June 3 for 18,000 ft. of 6-in. pipe. Prices are steady at \$37 to \$38 for 6-in. and larger diameters.

Coke.—Foundry coke under contract continues to move fairly well, but new business is quiet. Quotations remain at \$5 for both spot and contract.

Old Material.—Demand has been a little stronger this month than last, but the market is still weak. Quotations are unchanged.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:	
Heavy melting steel.....	\$12.50
Scrap steel rails.....	13.00
Short shoveling turnings..	9.00
Cast iron borings.....	9.00
Stove plate.....	13.00
Steel axles.....	21.00
Iron axles.....	23.00
No. 1 railroad wrought.....	\$10.00 to 10.50
Rails for rolling.....	14.00 to 15.00
No. 1 cast.....	14.00
Tramcar wheels.....	13.00 to 14.00
Cast iron carwheels.....	13.00 to 13.50
Cast iron borings, chem....	13.50 to 14.00

Canada

Structural Steel Still in Active Demand

Pig Iron.—A lull in buying occurred in the past week. Spot sales comprise the only activity at present, and the majority of these are confined to car lots. Prices have lost some of their strength in the past few days. While there is a spread in quotations of 50c. a ton, most of the current sales are at the lower figure, \$24.10, delivered Toronto.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75.	\$24.10 to \$24.60
No. 2 fdy., sil. 1.75 to 2.25.	24.10 to 24.60
Malleable.....	24.10 to 24.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75.	\$25.50 to \$26.00
No. 2 fdy., sil. 1.75 to 2.25.	25.50 to 26.00
Malleable.....	25.50 to 26.00
Basic.....	24.50 to 25.00
Imported Iron, Montreal Warehouse	
Summerlee.....	\$33.50
Carron.....	33.00

Structural Steel.—While sales for the past week were chiefly in small tonnages, total business was large. The demand for structural shapes is general throughout Canada. Building programs under way and in prospect involve large tonnages. The Standard Steel Construction Co., Welland, Ont., booked two orders during the week, one for 300 tons for addition to the Canadian General Electric Co. plant, Peterborough, Ont., and the other for 400 tons for an addition to the plant of the American Cyanamid Co., Niagara Falls, Ont. Some fair-sized tonnages are in prospect for immediate closing, including 3000 tons for the Ford Hotel at Montreal; 1200 tons for department store at Montreal for the John Murphy Co., Ltd.; 1200 tons for two buildings for the Northern Electric Co., Montreal; 500 tons for bridge over the Rideau River at Bronson Street, Ottawa, Ont., for the Federal District Commission.

Old Material.—While the market is without special feature, business is holding at a satisfactory level. Future delivery orders are backward, but spot demand continues active, with consumers buying regularly in small tonnages for immediate needs. Difficulty in procuring some materials is reported by dealers, while the supply of other grades is fairly large. Prices are firm.

Dealers' buying prices:

	Per Gross Ton	
	Toronto	Montreal
Heavy melting steel.....	\$10.00	\$8.50
Rails, scrap.....	11.00	9.00
No. 1 wrought.....	10.00	12.00
Machine shop turn- ings.....	7.50	5.00
Boiler plate.....	7.50	6.00
Heavy axle turnings.....	8.00	7.50
Cast borings.....	7.50	5.00
Steel turnings.....	7.50	6.50
Wrought pipe.....	6.00	6.00
Steel axles.....	15.00	20.00
Axles, wrought iron.....	17.00	22.00
No. 1 machinery cast.....	17.00	17.00
Stove plate.....	13.00	13.00
Standard carwheels.....	16.00	16.00
Malleable.....	13.00	13.00
Per Net Ton		
No. 1 mach'y cast.....	\$16.00	....
Stove plate.....	12.00	....
Standard carwheels.....	15.00	....
Malleable scrap.....	14.00	....

Buffalo

Steel Scrap Declines on Large Purchases

BUFFALO, May 21.—Third quarter inquiry for pig iron has not yet appeared, and the market is very quiet, although producers are looking for an active movement in the next few weeks. Aside from a 1000-ton lot for a New Jersey melter, the demand is limited to small tonnages. Buffalo producers continue to quote \$18.50 for Eastern delivery, with some \$18 iron moving. The price in this district is quite firm at \$19.50. The first fleet of barges with Buffalo iron for Eastern storage left here last week.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25.	\$18.50 to \$19.50
No. 2X fdy., sil. 2.25 to 2.75.	19.00 to 20.00
No. 1 fdy., sil. 2.75 to 3.25.	20.00 to 21.00
Malleable, sil. up to 3.25.	19.00 to 20.00
Basic.....	17.50 to 18.50
Lake Superior charcoal....	27.28

Old Material.—The feature of the market was the purchase of 25,000 to 30,000 tons of No. 1 heavy melting steel and No. 2 heavy melting steel by the largest consumer at \$16.50 for No. 1 and \$15 for No. 2. The orders as usual, will result in a considerably heavier delivery of No. 2 steel than of No. 1. The last strictly No. 1 sale was at \$17.25 to \$17.50, and

Warehouse Prices. f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes.....	3.40c.
Soft steel bars.....	3.30c.
Reinforcing bars.....	2.95c.
Cold-fin. flats, sq. and hex.....	4.45c.
Rounds.....	3.95c.
Cold-rolled strip steel.....	5.85c.
Black sheets (No. 24).....	4.20c.
Galv. sheets (No. 24).....	4.85c.
Blue ann'l'd sheets (No. 10).....	3.50c.
Com. wire nails, base per keg.....	\$3.60
Black wire, base per 100 lb.....	3.75

that occurred two weeks ago. Dealers continue to offer \$17.25 to \$17.50 for No. 1 steel on old orders. Otherwise the market is rather quiet. The largest consumer here continues to receive scrap from Detroit at the rate of two boatloads a week, and during May expects to move from that source 30,000 tons, principally flashings and hydraulic compressed sheets.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades	
No. 1 heavy melting steel.....	\$16.50 to \$17.50
No. 2 heavy melting steel.....	14.75 to 15.00
Scrap rails.....	17.00 to 18.00
Hydraul. comp. sheets.....	14.75 to 15.00
Hand bundled sheets.....	12.00 to 12.50
Drop forge flashings.....	14.00 to 14.50
No. 1 busheling.....	15.50 to 16.50
Hvy. steel axle turnings.....	14.00 to 14.50
Machine shop turnings.....	7.50 to 7.75
No. 1 railroad wrought.....	13.50 to 14.00
Acid Open-Hearth	
Knuckles and couplers.....	19.50 to 20.00
Coil and leaf springs.....	19.50 to 20.00
Rolled steel wheels.....	19.50 to 20.00
Low phos. billet and bloom ends.....	20.00 to 20.50
Electric Furnace Grades	
Short shov. steel turnings.....	12.00 to 12.50
Blast Furnace Grades	
Short mixed borings and turnings.....	11.00 to 12.00
Cast iron borings.....	11.00 to 12.00
No. 2 busheling.....	10.00 to 10.50
Rolling Mill Grades	
Steel car axles.....	18.75 to 19.25
Iron axles.....	21.00 to 22.00
Cupola Grades	
No. 1 machinery cast.....	16.00 to 17.00
Stove plate.....	13.50 to 14.00
Locomotive grate bars.....	13.50 to 14.00
Steel rails, 3 ft. and under.....	20.50 to 21.00
Cast iron carwheels.....	14.00 to 14.50
Malleable Grades	
Industrial.....	19.75 to 20.00
Railroad.....	19.75 to 20.00
Agricultural.....	19.50 to 20.00
Special Grades	
Chemical borings.....	12.50 to 13.50

Cincinnati

Sheet Orders Decline, Pig Iron Quiet

CINCINNATI, May 21.—Aside from a sale of 5000 tons of Northern foundry iron to a southern Ohio melter, third quarter buying has been almost at a standstill. The foundry melt in this district is of substantial volume and consumers are taking iron at a normal rate on current contracts, but there is a notable lack of interest on the part of the trade in anticipating requirements beyond July 1. The price structure in the South remains weak. Northern foundry iron is quoted at \$18.50, base furnace. Jackson County silvery iron stocks have been reduced to a low point, partly because one company has been inactive for several months pending the blowing in of a newly-constructed furnace.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25.....	\$19.89 to \$20.39
Ala. fdy., sil. 1.75 to 2.25.	18.69 to 19.19
Ala. fdy., sil. 2.25 to 2.75.	19.19
Tenn. fdy., sil. 1.75 to 2.25	19.19
S'th'n Ohio silvery, 8 per cent.....	27.89 to 28.89

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

Finished Material.—Specifications and orders for sheet steel declined

slightly the past week, but unfilled tonnage of district mills is sufficient to assure production at or near full capacity during the remainder of the quarter. Practically all second quarter business has been placed, and, pending the development of a buying movement for third quarter, sales have dipped below the high level maintained almost without interruption in recent months. The American Rolling Mill Co. has adopted the new classification of blue annealed sheets and is quoting No. 10 gage at 2.20c., Pittsburgh, and No. 13 gage at 2.35c. This company has announced that black sheets for third quarter will be 2.95c., Pittsburgh, the price announced by most mills for this quarter, but \$2 a ton above the figure at which considerable of the second quarter business has been done.

Coke.—Automobile foundries are beginning to cut down specifications and orders for by-product foundry coke. Nevertheless, shipments this month will fall only slightly short of those in April.

Old Material.—The market remains quiet, but dealers are paying good prices for desirable grades of scrap. In fact, railroads received considerably more for a number of items this month than in April. No. 1 machinery and railroad cast are showing signs of weakness, but no actual decline has been recorded.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel.....	\$13.00 to \$13.50
Scrap rails for melting.....	13.75 to 14.25
Loose sheet clippings.....	9.50 to 10.00
Bundled sheets.....	10.50 to 11.00
Cast iron borings.....	9.00 to 9.25
Machine shop turnings.....	8.50 to 8.75
No. 1 busheling.....	10.50 to 11.00
No. 2 busheling.....	6.75 to 7.00
Rails for rolling.....	14.50 to 15.00
No. 1 locomotive tires.....	14.25 to 14.75
No. 2 railroad wrought.....	13.00 to 13.50
Short rails.....	18.50 to 19.00
Cast iron carwheels.....	12.75 to 13.25
No. 1 machinery cast.....	19.25 to 19.75
No. 1 railroad cast.....	15.25 to 15.75
Burnt cast.....	10.25 to 10.75
Stove plate.....	10.25 to 10.75
Brake shoes.....	10.25 to 10.75
Railroad malleable.....	15.25 to 15.75
Agricultural malleable.....	14.25 to 14.75

Mead Morrison Co. is erecting a new unloading bridge at the river docks of the Iroquois plant of the Youngstown Sheet & Tube Co. to replace a bridge wrecked in a storm last fall.

Warehouse Prices, f.o.b. Cincinnati

Base per Lb.	
Plates and struc. shapes.....	3.40c.
Bars, soft steel or iron.....	3.30c.
New billet reinfrc. bars.....	3.15c.
Rail steel reinfrc. bars.....	3.00c.
Hoops.....	4.05c.
Bands.....	3.50c.
Cold-fin. rounds and hex.....	3.85c.
Squares.....	4.35c.
Black sheets (No. 24).....	4.05c.
Galvanized sheets (No. 24).....	4.90c.
Blue ann'd sheets (No. 10).....	3.45c.
Structural rivets.....	3.85c.
Small rivets.....	.65 per cent off list
No. 9 ann'd wire, per 100 lb.....	\$3.00
Com. wire nails, base per keg.....	2.95
Cement c't'd nails, base 100 lb. keg.....	2.95
Chain, per 100 lb.....	8.75
Net per 100 Ft.	
Lap-weld steel boiler tubes, 2-in.....	\$16.00
4-in.....	33.00
Seamless steel boiler tubes, 2-in.....	17.00
4-in.....	34.00

St. Louis

Pig Iron Shipments Heavy But Buying Is Small— Building Strike Affects Steel Fabricators

ST. LOUIS, May 21.—Although the melt of pig iron in the district is well sustained and shipments are being made according to schedule, buying is light, and melters are proceeding cautiously in placing orders for third quarter delivery. Shipments of the St. Louis Gas & Coke Corporation for the first 15 days of May totaled 18,000 tons, against production of 15,000 tons, and this month is expected to break all records for shipments by this maker, whose sales in the week were 1200 tons, including 250 tons to a car manufacturer in Illinois, deliveries running into third quarter. Sales of Southern iron were small. The market is firm at unchanged prices.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b.	
Granite City, Ill.....	\$20.00
Malleable, f.o.b. Granite City.....	20.50
N'th'n No. 2 fdy., deliv'd St. Louis.....	22.16
Southern No. 2 fdy., deliv'd.....	\$19.42 to 19.92
Northern malleable, deliv'd.....	22.16
Northern basic, deliv'd.....	22.16

Freight rates: 75c. (average) Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

Old Material.—This week finds only a few price changes, cast iron car wheels being 25c. lower and railroad cast 50c. down. Railroad lists the preceding week were heavy, and dealers in Oklahoma and Kansas, who formerly shipped to Colorado, are looking to St. Louis for an outlet for their stocks. Railroad lists include: Chicago, Burlington & Quincy, 5700 tons; Chicago, Milwaukee, St. Paul & Pacific, 1500 tons of steel rail and 15 carloads of miscellaneous scrap iron; Chicago, Indianapolis & Louisville, 780 tons, and Frisco Lines, 26 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

No. 1 heavy melting or shoveling steel.....	\$13.50 to \$14.00
No. 2 heavy melting or shoveling steel.....	13.00 to 13.50
No. 1 locomotive tires.....	15.00 to 15.50
Miscel. stand-sec. rails including frogs, switches and guards, cut apart.....	15.00 to 15.50
Railroad springs.....	17.00 to 17.50
Bundled sheets.....	10.00 to 10.50
No. 2 railroad wrought.....	13.50 to 14.00
No. 1 busheling.....	10.00 to 10.50
Cast iron borings and shoveling turnings.....	9.50 to 10.00
Iron rails.....	15.00 to 15.50
Rails for rolling.....	15.50 to 16.00
Machine shop turnings.....	8.00 to 8.50
Heavy turnings.....	10.00 to 10.50
Steel car axles.....	18.75 to 19.25
Iron car axles.....	26.50 to 27.00
Wrot. iron bars and trans.....	22.00 to 22.50
No. 1 railroad wrought.....	13.50 to 14.00
Steel rails, less than 3 ft.....	16.50 to 17.00
Steel angle bars.....	14.50 to 15.00
Cast iron carwheels.....	14.25 to 14.75
No. 1 machinery cast.....	15.50 to 16.00
Railroad malleable.....	16.00 to 16.50
No. 1 railroad cast.....	15.00 to 15.50
Stove plate.....	13.00 to 13.50
Agricult. malleable.....	15.00 to 15.50
Relay. rails, 60 lb. and under.....	20.50 to 23.50
Relay. rails, 70 lb. and over.....	26.50 to 29.00

Finished Iron and Steel.—Structural work is at a standstill in St. Louis as the result of a strike of iron workers, concrete workers and building laborers. There is no prom-

Warehouse Prices, f.o.b. St. Louis

Base per Lb.	
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
Cold-fin. rounds, shafting, screw stock.....	3.75c.
Black sheets (No. 24).....	4.25c.
Galv. sheets (No. 24).....	5.10c.
Blue ann'd sheets (No. 10).....	3.45c.
Black corrug. sheets (No. 24).....	4.30c.
Galv. corrug. sheets.....	5.15c.
Structural rivets.....	3.95c.
Boiler rivets.....	3.95c.
Per Cent Off List	
Tank rivets, 7/8-in. and smaller, 100 lb. or more.....	65
Less than 100 lb.....	60
Machine bolts.....	60
Carriage bolts.....	60
Lag screws.....	60
Hot-pressed, nuts, sq., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50

ise of an early settlement. Some structural fabricators are proceeding with shop work and are storing the finished material, but others are suspending operations. The Laclede Steel Co. was awarded 1000 tons of reinforcing bars for the Pillsbury mill and elevator, Springfield, Ill. May warehouse business is expected to run 15 per cent ahead of that of last May, largely because of buying by railroads of car repair material.

Youngstown

Full Production Continues in Sheets and Strips

YOUNGSTOWN, May 21.—The high activity of steel mill operations in this district does not yet show any declining tendencies. Open-hearth furnaces are being operated at practical capacity, and slight changes from week to week are usually traceable to interruptions for repairs or replacement. The supply of semi-finished steel is barely adequate, but the scarcity has not brought about any marked curtailment in finishing mill operations. Sheet mills are running at their limit, and tin plate and strip production is nearly as heavy.

Makers of sheets are now well booked through the remainder of the quarter. Many cannot take additional tonnage for shipment in June except under unusual circumstances. Shipments to the automobile industry are just as heavy as they have been. In some cases, substantial tonnages are being refused. Automobile body sheets are probably in the greatest demand, with mills unable to promise deliveries in less than eight weeks. Commitments in the common grades of sheets are also very heavy, and as mills have not reduced their backlogs since early in March, the pressure for deliveries is still a serious problem.

Boston

Pig Iron Buyers Hold Off—Steel Plate Consumption Large —Scrap Market Weaker

BOSTON, May 21.—Bookings of pig iron the past week dropped almost to the vanishing point. It was the dull-est week in months. Foundries are in no hurry to cover for third quarter, preferring to await price developments. The inquiry of the Whittin Machine Works, Whitinsville, Mass., for 2000 tons of No. 1X iron for third quarter remains unfilled. The company is reported to have turned down offers equivalent to \$19 a ton, Buffalo furnace. This inquiry is the only one large enough to test the market.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25...	\$22.91 to \$23.41
*Buffalo, sil. 2.25 to 2.75...	23.41 to 23.91
East Penn., sil. 1.75 to 2.25	25.15
East Penn., sil. 2.25 to 2.75	25.65
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
Ala., sil. 1.75 to 2.25	21.91 to 24.27
Ala., sil. 2.25 to 2.75	22.41 to 24.77

Freight rates: \$4.91 all rail from Buffalo; \$3.65 from eastern Pennsylvania; \$5.21 all rail from Virginia; \$6.91 to \$8.77 from Alabama.
*All rail rate.

Reinforcing Bars.—The only sizable inquiry in the market for billet steel reinforcing bars is for 500 tons for a girl's clubhouse, and the project is rather indefinite. During the past week a fair tonnage in small individual lots was placed at 2.66½c. per lb., base, from stock. Rail steel bars are inactive at 2.26½c. per lb., base, delivered common Boston freight rate points.

Shapes and Plates.—Indications are that New England consumption of plates in the current quarter will be heavier than for any similar period

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams.....	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes.....	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats.....	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.915c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex.....	*3.55c. to 5.55c.
Spares and flats.....	*4.05c. to 7.05c.
Toe calk steel.....	6.00c.
Rivets, structural or boiler.....	4.50c.
Per Cent Off List	
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

since the war. Mills quote 1.95c. to 2c. per lb., base Pittsburgh, but on sizable tonnages 1.90c. can be done. Most of the fabricating steel jobs booked the past week were small, but there were quite a few of them, so the aggregate tonnage was satisfactory. The price on standard shapes is generally 1.90c., Pittsburgh.

Coke.—The New England Coal & Coke Co., the Providence Gas Co. and the New Haven ovens have opened their books for last half by-product foundry coke contracts, and a majori-

ty of New England foundries have signed up. The ovens are protecting customers against a higher price than \$11 a ton, delivered within a \$3.10 freight rate zone. The New England Coal & Coke Co. has tentative plans for a new \$3,000,000 battery of ovens.

Old Material.—Dealers report a ready Pennsylvania market for various kinds of scrap at prices at which some owners of old material are not willing to sell: consequently shipments out of New England are even less active than a week ago. What little current activity there is centers very largely in T and girder rails, heavy melting steel, forge scrap, steel turnings, steel mill borings and long bundled skeleton. Prices for heavy melting steel are unchanged, but those on other materials are easier. The export market is moderately active at \$10.50 a ton on dock for light steel scrap and at \$11 for heavier material. Dealers have modified their prices on No. 1 machinery and have secured some round tonnages as a result.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel.....	\$11.50 to \$11.75
Scrap T rails.....	11.00 to 11.25
Scrap girder rails.....	10.50 to 10.75
No. 1 railroad wrought.....	12.00 to 12.50
No. 1 yard wrought.....	9.50 to 10.00
Machine shop turnings.....	6.50 to 6.60
Cast iron borings (steel works and rolling mill).....	6.50 to 6.60
Bundled skeleton, long.....	8.50 to 10.00
Forged flashings	10.00 to 10.50
Blast furnace borings and turnings	5.75 to 6.00
Forge scrap	8.75 to 9.00
Shafting	14.00 to 14.25
Steel car axles.....	17.00 to 17.50
Wrought pipe 1 in. in diameter (over 2 ft. long).....	10.50 to 11.00
Rails for rolling.....	12.00 to 12.50
Cast iron borings, chemical.....	10.00 to 10.25
Prices per gross ton deliv'd consumers' yards:	
Textile cast	\$14.50 to \$15.00
No. 1 machinery cast.....	16.00 to 16.50
No. 2 machinery cast.....	14.00 to 14.50
Stove plate	11.50 to 12.00
Railroad malleable	19.00 to 19.50

still rising. This is contrary to the view prevalent 60 days ago, that March production would be the 1929 peak. Another significant thing that the present figures indicate is that no one company is showing sensational gains. The increases are well distributed throughout the industry.

The accompanying table indicates the relative standing of the various companies to date.

The structural field shows a dearth of large projects.

Some slightly weaker tendencies have been noted in the old material market, principally on long turnings, which have declined 50c. a ton. This was due to the fact that one of the largest producers dumped about 15,000 tons of this material on the market about a week ago.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	\$14.00 to \$14.50
Borings and short turnings	9.00 to 9.50
Long turnings	7.25 to 7.75
No. 1 machinery cast.....	14.50 to 15.00
Automobile cast	16.00 to 16.50
Hydral. comp. sheets.....	14.00 to 14.50
Stove plate	9.50 to 10.00
New No. 1 busheling.....	12.00 to 12.50
Old No. 1 busheling.....	11.00 to 11.50
Sheet clippings	9.00 to 9.50
Flashings	12.00 to 12.50

Detroit

May Automobile Output Will Approximate That of April —Weaker Tendency in Scrap Market

DETROIT, May 21.—The automotive industry remains the center of interest in the demand for steel in this

territory. Practically all the figures on April production have been received, and indicate that volume is

	March	April	Estimated for May
Auburn	2,308	2,565	2,500
Buick	15,206	11,119	11,000
Cadillac and LaSalle.....	4,099	4,206	4,200
Chandler	2,100	2,500	2,750
Chevrolet	*147,274	*157,137	160,000
Chrysler		59,785	60,000
Durant	11,092	11,404	11,500
Ford	181,894	190,388	210,000
Franklin	1,569	1,641	1,600
Gardner	700	700	750
Graham-Paige	9,610	*11,550	13,050
Hudson and Essex.....	44,295	44,447	48,500
Hupp	4,316	6,111	6,200
Jordan	400	600	650
Lincoln	800	800	800
Marmon and Roosevelt.....	3,604	*6,029	6,500
Moon	450	600	650
Nash	15,384	16,066	17,000
Oakland and Pontiac.....	24,460	*26,384	36,000
Oldsmobile and Viking.....	13,099	15,752	16,000
Packard	4,780	4,750	4,700
Peerless	1,107	1,778	1,800
Pierce Arrow	1,100	1,366	1,620
Reo	1,611	*5,716	6,000
Stearns-Knight	275	300	300
Studebaker	14,000	14,000	14,000
Stutz	550	750	800
Willys-Overland	38,400	40,248	40,000

*Estimated.

Fabricated Structural Steel

Awards of Nearly 53,000 Tons Include 22,500 Tons for New York Elevated Highway

STRUCTURAL steel awards, at nearly 53,000 tons, were swelled by the letting of 22,500 tons for the first section of the West Side elevated highway in New York City, the steel to be furnished by a Pittsburgh fabricator. The only other award of outstanding size was 6600 tons for the Hotel Pierre, New York. Business added to the pending list totaled less than 18,000 tons of which 5000 tons is for a club building in Chicago. Awards follow:

BOSTON, 550 tons, building on Newbury Street, to Levering & Garrigues Co.
 BOSTON, 250 tons, hospital unit, to New England Structural Co.
 CAMBRIDGE, MASS., 1000 tons, highway bridges, to Phoenix Bridge Co.
 RICHMOND, VT., 450 tons, State bridge, to American Bridge Co.
 STATE OF VERMONT, 300 tons, highway bridges, to Pittsburgh-Des Moines Steel Co.
 STATE OF NEW YORK, 200 tons, highway bridge, to American Bridge Co.
 NEW YORK, 300 tons, alterations in Pennsylvania Station, to Phoenix Bridge Co.
 NEW YORK, 1000 tons, subway construction work, to Bethlehem Steel Co.
 NEW YORK, 22,500 tons, West Side highway, to Fort Pitt Bridge Works.
 NEW YORK, 1000 tons, addition to School of Commerce, College of City of New York, to Dreier Iron Works.
 NEW YORK, 350 tons, garage on East Seventy-sixth Street, to Dreier Iron Works.
 NEW YORK, 450 tons, apartment building at Fifty-eighth Street and First Avenue, to Dreier Iron Works.
 NEW YORK, 600 tons, Baptist Home for Aged, to Hedden Iron Construction Co.
 NEW YORK, 6600 tons, Hotel Pierre, Fifth Avenue and Sixtieth Street, to American Bridge Co.
 NEW YORK, 125 tons, hospital building, Baychester Avenue, to Elby Structural Steel Co.
 NEW YORK, 1300 tons, warehouse at 80 Pearl Street, to Hedden Iron Construction Co.
 NEW YORK, 630 tons, school at 108 East Eighty-ninth Street, to Hinkle Iron Works.
 NEW YORK, 250 tons, garage at 433 East Seventy-first Street, to Kues Brothers.
 NEW YORK, 617 tons, factory at 192nd Street, to National Bridge Works.
 BROOKLYN, 200 tons, hospital on Kings Highway, to Gaynor & Rosenblum.
 BROOKLYN, 500 tons, bridge pontoons for Hagen Construction Corporation, to Jones & Laughlin Steel Corporation.
 LONG ISLAND CITY, N. Y., 150 tons, plant for Meurer Steel Barrel Co., Inc., to Austin Co.
 COLUMBIA, PA., 220 tons, warehouse for Columbia Malleable Iron Castings Co., to A. B. Rote & Co., Lancaster, Pa.
 PHILADELPHIA, 1100 tons, University Club building, to Shoemaker Bridge Co.
 CLEVELAND, 270 tons, skull cracker for Otis Steel Co., to Wellman-Seaver-Morgan Co.
 WEST CHARLESTON, W. VA., 800 tons, plant for Westvaco Chlorine Products Co., to Massillon Bridge & Structural Co.; H. K. Ferguson Co., general contractor.
 TAMPA, FLA., 635 tons, for United States Phosphoric Products Corporation, to Ingalls Iron Works.
 TAMPA, 540 tons, for S. H. Kress Co. store, to Ingalls Iron Works.
 CLEVELAND, 600 tons, locomotive repair shops and sheds for Cleveland Union

Terminal Co., to Massillon Bridge & Structural Co.
 YOUNGSTOWN, 150 tons, building for United Engineering & Foundry Co., to Guibert Steel Co.
 PENNSYLVANIA RAILROAD, 400 tons, bridge at Dayton, Ohio, to McClintic-Marshall Co.
 TOLEDO, 160 tons, building for National Supply Co., to American Bridge Co.
 GENEVA, OHIO, 110 tons, building for American Fork & Hoe Co., to Pittsburgh Bridge & Iron Co.
 GLENVIEW, ILL., 500 tons for Curtiss Airport, to Union Foundry Co., Chicago.
 CHICAGO, 140 tons, Chicago Screw Co., to Hansell-Elcock Co.
 CHICAGO, 250 tons, Fisk Street substation for Commonwealth Edison Co., to Wendnagel & Co., local.
 ST. PAUL, 400 tons, bridge for Northern Pacific, to McClintic-Marshall Co.
 DENVER, 1200 tons of plates, 96-in. siphon, Belle Fourche project, South Dakota, to Pittsburgh-Des Moines Steel Co.
 PULLMAN, WASH., 300 tons, State college field house, to Minneapolis Steel & Machinery Co.
 SEATTLE, 200 tons plates, boiler; awarded to unnamed Eastern mill by Puget Sound Machinery Depot.
 SEATTLE, 1000 tons, Fisher Body Co. plant, to Hofius Steel & Equipment Co.
 SEATTLE, 150 tons, boiler; awarded to unnamed Eastern mill by Puget Sound Machinery Depot.
 RENTON, WASH., 300 tons, power plant for Puget Sound Light & Power Co., to Hofius Steel & Equipment Co.
 RENTON, 275 tons, transmission towers and buss structure for Puget Sound Light & Power Co., to Pacific Coast Steel Co.
 LOS ANGELES, 2000 tons, transmission towers for Southern California Edison Co., to Emsco Derrick & Equipment Co.
 LOS ANGELES, 150 tons, candy factory, Avalon Boulevard, to Pacific Iron & Steel Co.
 SAN DIEGO, CAL., 250 tons, addition to telephone building, Southern California Telephone Co., to McClintic-Marshall Co.
 ALASKA, 235 tons, packing plant for Red Salmon Canning Co., to Truscon Steel Co.
 SAN FRANCISCO, 1500 tons, transmission towers for Brazilian Hydroelectric Co., Rio De Janeiro, Brazil, to Pacific Coast Steel Co.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

CAMBRIDGE, MASS., 600 tons, Harvard University stadium addition.
 BOSTON, 100 tons, children's hospital nurses' home, Roxbury district.
 HARTLAND, VT., 161 tons, State bridge.
 ROCKINGHAM, VT., 146 tons, State bridge.
 NEW YORK, 300 tons, building on Sixth Avenue for Horn & Hardart Co.
 NEW YORK, 8000 tons, all bids rejected on section 6, route 107, subway, and new bids requested.

READING RAILROAD, 430 tons, bridges.
 PENNSYLVANIA RAILROAD, 547 tons, bridge at Le Moyne, Pa.
 PENNSYLVANIA RAILROAD, 1000 tons, bridge construction in Pennsylvania, bids in.
 BLOOMFIELD, N. J., 600 tons, building for Bloomfield Bank & Trust Co.
 BETHLEHEM, PA., 700 tons, addition to office of Bethlehem Steel Co.; Graham. Anderson, Probst & White, architects.
 TOLEDO, OHIO, 500 tons, junior high school.
 CLEVELAND, 275 tons, canopies for Union Terminal Station.
 BALTIMORE & OHIO, 1000 tons, bridge at Newark, Ohio.
 LEXINGTON, KY., 250 tons, library for University of Kentucky.
 CHICAGO, tonnage being estimated, office building at Lake and Wells Streets; Thielbar & Fugard, architects.
 CHICAGO, 150 tons, Unitarian Parish House; R. C. Wieboldt, general contractor.
 CHICAGO, 5000 tons, proposed building for Frontenac Club.
 MILWAUKEE, 1300 tons, building for Freuler Hotel Corporation.
 CUDAHY, WIS., 600 tons, building for Cudahy Packing Co.
 SIOUX CITY, IOWA, 2800 tons, highway bridge; Missouri Valley Bridge & Iron Co., Leavenworth, Kan., low bidder.
 OMAHA, NEB., 300 tons, bridge for Union Pacific.
 LOS ANGELES 575 tons plates, 24-in. welded pipe line for city; Western Pipe & Steel Co., low bidder.
 SAN FRANCISCO, 935 tons, pier shed No. 48; bids opened.
 SAN FRANCISCO, 150 tons, second unit Continental Baking Co. plant; bids opened.
 SEATTLE, 160 tons, City-County Building addition; bids rejected.

Steel Rates from Fostoria, Ohio, Held Prejudicial

WASHINGTON, May 21.—Rates on iron and steel articles from Fostoria, Ohio, to Buffalo, Pittsburgh, Erie and New Castle, Pa., and Wheeling, W. Va., are unduly prejudicial to Fostoria and unduly preferential of Cleveland, it was held by A. E. Later, examiner, in a tentative report to the Interstate Commerce Commission. The record, however, it was said, does not afford a basis for correcting the situation, and it was therefore recommended that the complaint be dismissed, leaving it to the commission to prescribe an adequate remedy in its forthcoming decision in the general steel rate case covering rates throughout Official Classification territory. The examiner's report was based on a complaint by the Seneca Wire & Mfg. Co., Fostoria.

Gulf States Steel Awards Plate Mill Contract

The Gulf States Steel Co. has placed a contract with the Mackintosh-Hemp-hill Co. for a new electrically driven plate mill to be erected at its Alabama City works. This is the second contract awarded for new units in the company's development program. The United Engineering & Foundry Co. was awarded the blooming mill contract three weeks ago. The sheet mill contract is expected to be let within the next 30 days.

Non-Ferrous Metal Markets

Copper Inactive But Firm, Tin Quiet and Lower, Lead Active and Steady, Zinc Dull and Easier

NEW YORK, May 21.

Copper.—Business continues very light but prices are firm. Electrolytic copper is unchanged at 18c., delivered in the Connecticut Valley, with the quotation of Copper Exporters, Inc., at 18.30c., c.i.f. usual European ports. Primary producers continue entirely out of the market. Foreign and domestic demand is being taken care of by custom smelters, who are selling the large bulk of their intake each week. The production of these companies amounts to about 30,000 tons a month. Sales for domestic consumption are being made into August and cover deliveries from May to September. Not much August delivery has been contracted for. It is expected that active buying for August and perhaps September will start within the next two weeks. Sales to foreign producers are about 300 tons a day. They have still considerable June metal to buy as well as later deliveries, but are at present inactive owing to the reparations uncertainty. It is believed that an active market will result from the combined demand from foreign and domestic melters, and some predict higher instead of lower prices. Lake copper is only moderately active, with a fair business done for deliveries as far ahead as August at 18c. to 18.12½c., delivered.

Tin.—Sales have been light, with only about 600 tons contracted for during the week ended May 18. Dealers are not interested and consumers are practically out of the market. Yesterday about 100 tons was sold and today the market was quiet, with spot Straits quoted at 43.75c., New York. The London market, which was closed from Thursday until today because of the Whitsuntide holidays, opened today lower than a week ago, with spot standard at £196, future standard at £198 17s. 6d., and spot Straits at £197 10s. The Singapore price today was £202 5s. The only feature is the renewed buying of tin by the London group. This has been heavy since the metal fell below £200. While they have been able to check the decline to some extent, it is pointed out that they are having difficulty in holding the market.

Lead.—Fairly heavy buying char-

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	May 21	May 20	May 18	May 17	May 16	May 15
Lake copper, New York.....	18.12½	18.12½	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*.....	17.75	17.75	17.75	17.75	17.75	17.75
Straits tin, spot, N. Y.	43.75	43.87½	43.75	43.75	43.87½	44.12½
Zinc, East St. Louis.....	6.65	6.65	6.65	6.65	6.65	6.67½
Zinc, New York.....	7.00	7.00	7.00	7.00	7.00	7.02½
Lead, St. Louis.....	6.75	6.75	6.75	6.75	6.75	6.75
Lead, New York.....	7.00	7.00	7.00	7.00	7.00	7.00

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Rolled Products

Prices on rolled non-ferrous products are unchanged from those prevailing one week ago.

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over.

Sheets—	
High brass	23.25c.
Copper, hot rolled	26.75c.
Zinc	10.25c.
Lead (full sheets).....	11.00c. to 11.25c.
Seamless Tubes—	
High brass	28.25c.
Copper	29.25c.
Rods—	
High brass	21.25c.
Naval brass	24.00c.
Wire—	
Copper	19.87½c.
High brass	23.75c.
Copper in Rolls	26.75c.
Brazed Brass Tubing.....	30.87½c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

Sheets, 0 to 10 gage, 3 to 30 in. wide	33.00c.
Tubes, base	42.00c.
Machine rods	34.00c.

Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—		Base per Lb.
High brass	23.25c.	
Copper, hot rolled.....	27.75c.	
Copper, cold rolled, 14 oz. and heavier	30.00c.	
Zinc	10.00c.	
Lead, wide	11.90c.	
Seamless Tubes—		
Brass	28.25c.	
Copper	29.25c.	
Brass Rods		21.25c.
Brazed Brass Tubes.....		31.00c.

New York or Cleveland Warehouse

Delivered Prices, Base Per Lb.

Sheets—	
High brass	21.12½c. to 22.12½c.
Copper, hot rolled, base sizes	27.75c. to 28.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	30.00c. to 31.00c.
Seamless Tubes—	
Brass	26.00c. to 27.00c.
Copper	29.12½c. to 30.12½c.
Brazed Brass Tubes.....	
	29.12½c. to 30.12½c.
Brass Rods	
	18.87½c. to 19.87½c.

New York Warehouse

Delivered Prices, Base Per Lb.

Zinc sheets (No. 9), casks	10.50c. to 11.00c.
Zinc sheets, open.....	11.50c. to 12.00c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	46.00c. to 47.00c.
Tin, bar	48.00c. to 49.00c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	19.00c.
Zinc, slab	7.75c. to 8.25c.
Lead, American pig.....	7.75c. to 8.25c.
Lead, bar	9.75c. to 10.25c.
Antimony, Asiatic	11.00c. to 11.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy.....	24.00c. to 25.00c.
Babbitt metal, commercial grade.....	30.00c. to 40.00c.
Solder, ½ and ½.....	29.50c. to 30.50c.

Metals from Cleveland Warehouse

Delivered Prices Per Lb.

Tin, Straits pig.....	48.75c.
Tin, bar	50.75c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	18.75c.
Zinc, slab	7.75c. to 8.00c.
Lead, American pig	7.75c. to 8.00c.
Lead, bar	10.00c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade.....	19.00c.
Babbitt metal, high grade.....	52.75c.
Solder, ½ and ½.....	31.50c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged customers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible.....	14.00c.	16.00c.
Copper, hvy. and wire	13.75c.	15.00c.
Copper, light and bottoms	12.00c.	13.00c.
Brass, heavy.....	8.25c.	9.00c.
Brass, light	7.00c.	8.00c.
Hvy. machine composition	11.25c.	12.50c.
No. 1 yel. brass turnings	9.50c.	11.00c.
No. 1 red brass or compos. turnings.....	11.00c.	12.00c.
Lead, heavy	5.50c.	6.25c.
Lead, tea	4.75c.	5.75c.
Zinc	3.75c.	4.50c.
Sheet aluminum.....	14.00c.	16.00c.
Cast aluminum.....	12.50c.	14.50c.

acterized the market toward the end of last week, and there has been a fair business done so far this week. Sales have been evenly divided between May and June, and prices are a little firmer though unchanged. At St. Louis, the leading producer still quotes 6.80c., but there are others selling at 6.75c. The leading interest still maintains its New York contract price at 7c.

Zinc.—Quotations and sales of prime Western zinc are at such widely varying limits that a market quotation is difficult. It is stated that a majority of producers are holding at 6.80c., East St. Louis, and some sales have been made at this level. Three or four other companies are apparently anxious for business at lower levels, and the bulk of their business has evidently been done at 6.65c., with one company quoting 6.60c. Demand, however, is not heavy. On Saturday, Joplin's ore price was again \$44. Shipments were fairly large at 10,950 tons, but the expected curtailment in output has not materialized. For the last four weeks the production has been about 52,900 tons and shipments have totaled about 38,000 tons. Stocks have increased and are estimated at over 31,400 tons, the largest since January.

Antimony.—The market continues inactive, with Chinese metal unchanged at 9c. per lb., New York, duty paid, for all positions.

Nickel.—Ingot nickel in wholesale lots is still quoted at 35c. with shot nickel at 36c. and cathodes of electrolytic nickel at 35c. per lb.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at the published price of 23.90c. per lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, May 21.—Spot sales are in moderate volume in a market which lacks strength. Prices for tin, zinc and antimony are lower. The old metal market is quiet and prices are unchanged.

Prices per lb., in carload lots:

Lake copper, 18.12½c.; tin, 44.75c.; lead, 6.85c.; zinc, 6.65c.; in less-than-carload lots: antimony, 9.87½c.. On old metals we quote copper wire, crucible shapes and copper clips, 14.50c.; copper bottoms, 11.50c.; red brass, 11.50c.; yellow brass, 8c.; lead pipe, 4.50c.; zinc, 3.75c.; pewter, No. 1, 24.50c.; tin foil, 26c.; block tin, 36c.; aluminum, 12.87½c.; all being dealers' prices for less-than-carload lots.

Unfilled Non-Ferrous Ingot Orders on May 1

On May 1, unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-ferrous Ingot Metal Institute amounted to 17,215 net tons, according to an announcement of the institute. On April 1, the unfilled orders were 22,755 tons.

Sheet Output and Shipments Break Record

Totals for First Third of Year Exceed Those of 1928, and Unfilled Tonnage Gains Sharply

PRODUCTION and shipments of steel sheets during the first four months of 1929 broke all records. Sales declined. Unfilled tonnage on May 1 on the books of independent mills gained sharply over the previous month's figure. These results are announced by the National Association of Flat Rolled Steel Manufacturers.

Sheet output in the first third of the year was larger by 116,184 tons than during the corresponding period last year, when the previous high mark was established, and shipments were 169,237 tons greater.

A comparison for the first four months of each of the past four years follows:

	Production	Shipments
1929.....	1,457,326	1,428,989
1928.....	1,341,142	1,259,752
1927.....	1,241,467	1,139,725
1926.....	1,297,139	1,232,893

The record of the sheet steel industry during the past three months, including April, is shown in the following table:

	April	March	Feb.
Total number of mills.....	722	722	722
Capacity per month.....	482,000	468,200	440,600
Percentage reporting.....	67.6	67.6	67.6
Sales.....	398,206	464,397	389,496
Production.....	375,256	364,202	326,468
Shipments.....	377,274	363,648	325,848
Unfilled orders.....	835,801	791,615	706,955
Unshipped orders.....	121,164	125,653	127,383
Unsold stocks.....	54,142	63,397	61,058
Percentages of Capacity			
Sales.....	122.3	146.8	130.8
Production.....	115.2	115.2	109.7
Shipments.....	115.9	115.0	109.5
Unfilled orders.....	256.8	250.3	237.5
Unshipped orders.....	37.2	39.7	42.8
Unsold stocks.....	16.6	20.0	20.5

Reinforcing Steel

Awards of 6000 Tons—New Inquiries in Small Volume

THE largest awards reported include 1000 tons for the Fisher Body Co. plant at Seattle and 1000 tons for a flour mill and elevator at Springfield, Ill., the week's total amounting to about 6000 tons. Pending inquiries are mostly in small lots and call for about 3000 tons. Awards follow:

NEW YORK, 130 tons, Santini Brothers, Inc., warehouse in Morris Avenue, to Jones & Laughlin Steel Corporation.
NEW YORK, 800 tons, warehouse in Whitlock Avenue for Sachs Quality Furniture Co., Inc., to Truscon Steel Co., instead of another company, as reported last week.
NEW YORK, 380 tons, West Side elevated highway, first section, to Day & Goater.
LONG ISLAND CITY, N. Y., 800 tons, building for Anchor Cap & Closure Corporation, to Truscon Steel Co.
BRIDGEPORT, CONN., 175 tons, telephone company building, to Truscon Steel Co.
PHILADELPHIA, 300 tons, Reyburn Building, to Truscon Steel Co.
AURORA, ILL., 130 tons, theater, to Olney J. Dean & Co.
EVANSTON, ILL., 140 tons, building for Marshall Field & Co., to Calumet Steel Co.; previously reported to unnamed bidder.

CHICAGO, 160 tons, viaduct at Eighty-seventh Street for Illinois Central Railroad, to American System of Reinforcing.

CHICAGO, 800 tons, apartment building, to Calumet Steel Co.

CHICAGO, 250 tons, Lydy garage, to Inland Steel Co.

SPRINGFIELD, ILL., 1000 tons, Pillsbury mill and elevator, to Laclede Steel Co.

JACKSON, MISS., 480 tons, for Merchants Bank & Trust Co., to Connors Steel Co.

LITTLE ROCK, ARK., 150 tons, high school, to Connors Steel Co.

SAN FRANCISCO, 185 tons, second unit Continental Baking Co. plant, to Truscon Steel Co.

SEATTLE, 1000 tons Fisher Body Co. plant, to Pacific Coast Steel Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

BOSTON, 500 tons, girls' clubhouse.

STATE OF VERMONT, 200 tons, six State bridges.

BARRINGTON, ILL., 400 tons, building for the Jewel Tea Co.

EVANSTON, ILL., 300 tons, building for Illinois Bell Telephone Co.

SANTA ANA, CAL., 141 tons, paving, Santa Ana to Anaheim; bids June 4.

SACRAMENTO, CAL., 100 tons, Sutter Club; bids opened.

SACRAMENTO, 102 tons, paving in San Bernardino County; bids June 5.

SACRAMENTO, 149 tons, paving in Orange County; bids June 4.

SACRAMENTO, 293 tons, bridge over Feather River, Butte County; bids June 5.

SAN FRANCISCO, 100 tons, pier shed No. 48; bids opened.

SEATTLE, 2000 tons, City-County Building addition; bids rejected.

New High Record in Steel Barrel Production

WASHINGTON, May 21.—Making an increase of 29,419, steel barrels to the number of 771,584 were produced in April, against 742,165 in March, the rates of operations being 64.8 and 61 per cent of capacity respectively. Each, in turn, was the highest month's output on record.

Shipments were 775,481, against 743,407. Stocks at the end of April totaled 55,103 barrels, compared with 59,000 barrels at the end of March. Unfilled orders at the end of April for delivery within 30 days totaled 333,614 barrels, compared with 393,941 barrels at the end of March, while unfilled orders for delivery beyond 30 days were 935,430 barrels, compared with 1,076,317 barrels.

Production during the four months ended April 30 aggregated 2,639,639 barrels, compared with 2,299,532 barrels for the corresponding period of last year. This was a new high record. Shipments also established a record, at 2,631,001 barrels in four months.

PERSONAL

HARBOUR MITCHELL, since 1924 district manager of sales at Pittsburgh for E. J. Lavino & Co., Philadelphia, has been transferred to the general offices, where he will assume more important duties in the sales department. He is a graduate of the University of West Virginia, Morgantown, and before joining the Lavino organization, was identified for many



H. MITCHELL

years with the American Foundry & Construction Co., Pittsburgh. **ROBERT E. RUNYON**, who has been with the company's general sales department at Philadelphia since 1925, has succeeded Mr. Mitchell at Pittsburgh. Before joining the Lavino company, Mr. Runyon was identified with the Struthers Furnace Co., Struthers, Ohio, for 15 years, having served in sales capacities at Pittsburgh and Cleveland, and from 1922 to 1925, as district sales manager at Pittsburgh.

A. D. LYNCH, director of personnel, Ohio Brass Co., Mansfield, Ohio, spoke at the monthly meeting of the Pittsburgh Foundrymen's Association, held at the Fort Pitt Hotel, Pittsburgh, on May 20. Mr. Lynch outlined a plan for securing coordinated and cooperative endeavor among management, foremen and workers in the foundry. At the same meeting the following officers were elected: **L. W. MESTA**, Mesta Machine Co., Homestead, Pa., president; **W. E. TROUTMAN**, Duquesne Steel Foundry Co., Coraopolis, Pa., vice-president, and **WILLIAM J. BRANT**, Pittsburgh, secretary-treasurer. Members of the executive committee for the ensuing year are: **C. D. CAREY**, American Steel Foundries, Verona, Pa., and **L. V. STEVENS**, Marine Mfg. Supply Co.; **R. N. COOK**, Eclipse Pattern Co.; **F. C. T. DANIELS**, McIntosh-Hemphill Co., and **H. F. SEIFFERT**, Westinghouse Electric & Mfg. Co., all of Pittsburgh.

E. W. EDWARDS, president Edwards Mfg. Co., Cincinnati, manufacturer of sheet metal products, has resigned to accept the presidency of the Fifth Third Union Trust Co., Cincinnati. Mr. Edwards also is head of the Canonsburg Steel & Iron Works, Canonsburg, Pa., and of several other industrial manufacturing companies. He will be succeeded as president of the Edwards Mfg. Co. by his brother, **HOWARD W. EDWARDS**.

H. C. HEATON, formerly superintendent of track, United Electric Railways Co., Providence, R. I., has joined the organization of the Moisselle Welded Rail Joint Co., Philadelphia.

L. G. TANDBERG has been appointed branch manager of the Los Angeles sales office of Wagner Electric Corporation, St. Louis.

A. J. HULSE, assistant chief engineer, H. A. Brassert & Co., Chicago, sailed recently for England on a business trip for the company.

J. L. HOTT has been appointed plant engineer of the Buffalo plant, Wickwire Spencer Steel Co., New York. He has been with the company for some years and was formerly with the United Alloy Steel Corporation, Canton, Ohio, and with the Pittsburgh Crucible Steel Co., Pittsburgh.

H. B. BEVAN, formerly district sales manager at Kansas City, Mo., for the Buffalo Bolt Co., Buffalo, has been appointed manager of sales, Tulsa Rolling Mills Co., Tulsa, Okla.

E. C. GODFREY, for the past nine years with the Pratt & Whitney Co., Hartford, Conn., has become district sales manager for the Michigan territory, with offices in the Fisher Building, Detroit, for the Cuyahoga Steel & Wire Co., Cleveland.

GARRETT CONNORS has been appointed general purchasing agent for Truscon Steel Co., Youngstown. Mr. Connors was safety director, and the high morale of the production department is largely attributed to his work.

NEIL CURRIE, JR., for the past five years managing engineer of the motor department, Pittsfield works, General Electric Co., has been made manager of the Philadelphia works. **ROBERT V. GOOD**, section superintendent in the Schenectady works, has been named his assistant. **J. REEVES RUE**, heretofore assistant manager of the motor department, succeeds Mr. Currie.

R. J. GOODMAN GROUCH, formerly technical aeronautical representative for the British Empire, has been

made vice-president and chief aeronautical engineer of the Whittelsey Mfg. Co., Bridgeport, Conn.

HARRY EHRLICH, Springfield, Mass., was recently the guest of the Southern New England chapter, Institute of Scrap Iron and Steel. He spoke on the trade practice conference recently held in Washington.

JOSEPH W. DONNER, formerly general superintendent of the Donner Steel Co., Inc., Buffalo, has been elected vice-president in charge of



J. W. DONNER

operations. **ARTHUR G. GREENAMYER**, formerly assistant general superintendent, has been made general superintendent, and **DAVID G. BAXTER** is assistant general superintendent. Mr. Baxter has been open-hearth superintendent of the Pittsburgh Crucible Steel Co. at Midland, Pa.

DOUGLAS RULESON COLEMAN, Worthington Pump & Machinery Corporation, New York, has been made president of the Mount Hope Bridge Co., Providence, R. I. He succeeds his father, the late Charles Philip Coleman.

F. L. LINDEMUTH, formerly chief engineer at the plant of the Tata Iron & Steel Co., Jamshedpur, India, has joined the engineering staff of the Mesta Machine Co., Pittsburgh.

S. N. COMLY, formerly in the Chicago office of Russell, Burdall & Ward Bolt & Nut Co., will be in charge of the Pittsburgh office of the company.

Bureau of Supplies and Accounts, Navy Department, will open bids on May 31 for modernizing the battleship Arizona, requiring 2652 tons of black plates and 1141 tons of special treatment plates. The battleship Pennsylvania is to be similarly modernized later and probably will require a slightly larger steel tonnage.

April a Record Month in Automobile Output

WASHINGTON, May 21.—Production of motor vehicles in the United States in April increased 35,749 units to 620,656, against 584,907 (revised figure) in March, according to reports received by the Department of Commerce. The output of passenger cars increased 23,959 to 537,255 from 513,266, while the truck production rose 12,244 to 81,977 as compared with 69,733. Both figures for April are the highest ever recorded for any month. The number of taxicabs produced in April was 1454 as against 1908 in March.

Canadian production of motor vehicles in April was 41,901, an increase of 1280 over the March output of 40,621. Passenger car production in Canada increased 1559 to 34,392 from 32,833, while truck production decreased 279 to 7509 from 7788. Canadian total output and output of passenger cars made new high records in April.

Motor vehicle production in the United States during the first four months was 2,072,941, an increase of 693,999 over the output of 1,378,942 for the corresponding period of last year. Passenger car production increased 570,086 to 1,803,581 as against 1,233,495, while truck production increased 116,379 to 261,826 from 145,447.

Previously the largest production for the first four months was the 1,549,501 units of 1926, which now is bettered by 33 per cent. This consisted of 1,380,356 passenger cars—the record until this year—and 169,145 trucks. The 1927 output of trucks was the best for any first four months, until this year; it was 176,116 units.

Canadian motor vehicle production during the first four months of 1929 was 135,310, an increase of 72,663 over the 62,647 produced during the corresponding period of last year. Passenger car production was 109,973, an increase of 57,209 over the 52,764 during the first four months of 1928, while truck output was 25,337, a gain of 15,454 over the production for the corresponding period of last year.

Westinghouse Conducts Night Welding Classes

The Westinghouse Electric & Mfg. Co., East Pittsburgh, has inaugurated night classes in practical arc-welding instructions, designed especially for employees with duties during the day. The classes consist of two groups of students, each group meeting two nights a week for three hours each night over a period of three months. Each student receives individual instruction in the various phases of welding. Similar classes, conducted in the day school, are open to buyers or prospective buyers of arc-welding equipment.

OBITUARY

DWIGHT M. HOUSTON, foundry engineer, research and development department, International Nickel Co., New York, died of heart failure at his home in Indianapolis, Ind., April 28, aged 52 years. Previous to his connection with the Nickel company, he was associated with the Nordyke-Marmion Co., Indianapolis. He was a graduate of Miami University, Ox-



D. M. HOUSTON

ford, Ohio, and was well known because of his research work in connection with the application of nickel to gray iron castings. He was a member of the American Foundrymen's Association and of the American Society for Steel Treating.

FRANK BURGESS, president, Boston Gear Works Sales Co., Norfolk Downs, Mass., died of heart disease at his home in Wollaston, Mass., May 18, aged 69 years.

CALVIN W. VAUGHN, president, Vaughn Machinery Co., Cuyahoga Falls, Ohio, died of a heart attack, May 10. He attended school in Cuyahoga Falls and learned the machinist's trade in the shop of Turner, Vaughn & Taylor Co., in which his father had an interest. After his father's death he bought most of the stock of the company and was elected vice-president in 1892. Three years later he became president and continued in that position until his death. He was 70 years of age.

VANTYLE WILLIAM CODDINGTON, chairman of the board of directors, Lakeside Bridge & Steel Co., Milwaukee, died May 17 at his home, following a short illness. He was born in 1852 and was graduated from the University of Illinois in 1874, engaging in the practice of structural engineering. He joined the engineering staff of the Wisconsin Bridge & Iron Co., Milwaukee, in 1901, resigning in

1913 to establish the Lakeside company, of which he was president until a few years ago, when he was succeeded in the active direction of the business by his son, Samuel C. Coddington, now president and treasurer.

ALBERT E. PYOTT, president and treasurer of the Pyott Foundry Co., Chicago, died recently, aged 60 years.

ARNOLD L. EMPEY, secretary and treasurer, Foster Bolt & Nut Mfg. Co., Cleveland, died suddenly May 13 of heart trouble. He was born in Belleville, Ontario, and his parents later moved to Rochester, N. Y. He was graduated from Cornell University in 1898 and was an attorney in Rochester for several years. In 1918 he joined his uncle, A. M. Foster, president of the Foster company, as a member of that company's organization, and for the past seven years had been in charge of sales. He had a wide acquaintance in the bolt, nut and cap screw industry in the Central West.

J. C. BLAIR, of A. G. Kidston & Co., London and Glasgow, merchants and exporters of iron and steel, died May 15 at the age of 65 years.

ARMIN L. DREHER, traffic manager for the past 14 years for Hyman Michaels Co., Chicago, died May 19, following a brief illness. He was born in St. Paul in 1885 and attended the public schools in that city. His experience in traffic matters began with his employment by the Northern Pacific. Later he joined the organization of Swift & Co. in its St. Paul office. Upon moving to Chicago he worked for a time for the Chicago & Great Western and the Lehigh Portland Cement Co.

Electric Power Consumption Gains in April

Productive activity in the United States, as estimated by *Electrical World* on the basis of monthly consumption of electrical energy, was 136.4, against 135.7 in March. Both figures compare with 119.3 a year ago and with 100 as the average of 1923-1925.

The metal industries group has dropped from 154.9 to 149.9, with declines in both elements composing the group. Rolling mills and steel plants fell from 160.5 to 153.3, while other metal-working plants, both ferrous and non-ferrous, dropped from 151.4 to 148.3. Automobile manufacture, however, including the making of parts, advanced from 154.5 in March to 170.6 in April—the highest level ever reached.

All figures have been adjusted to a basis of 26 working days, thus accounting for difference in length of individual months.

Consumption Slowed Down in Britain

Pig Iron Supply Sold Through September and Prompt Metal
Not to Be Had—Dullness Rules in Germany

(By Cablegram)

LONDON, ENGLAND, May 21.

PIG iron markets are strong, as Cleveland makers are sold out until October and are unwilling to accept last-quarter business. Shortage of labor at iron ore mines prevents starting up additional furnaces. Minimum prices are no longer a criterion. Merchants have sold No. 3 foundry iron, G.M.B., at as high as 70s. (\$16.97) a ton. Hematite is scarce; the makers have sold out their anticipated production through the middle of July.

The Steel Association has advanced domestic prices by 5s. (\$1.21), but export prices, being under control of the Export Committee, are unchanged. It is officially denied that British makers secured a Japanese plate order at £6 11s. (1.44c. a lb.) f.o.b., as reported from France in a previous cablegram.

Buying here of Continental materials is quiet, owing to the holidays and the approach of the British general election. Semi-finished steel and beams are still strong, but merchant bars are weak.

Tin plate markets are less active. Consumers are deterred from buying by the uncertainty of the tin market,

but makers are well placed. Galvanized sheets are firm, on account of the restricted output and high production costs, but business is dull. Black sheets to Japanese specifications are idle, though prices have been reduced.

Indian railroads have placed orders for 39 locomotives with the Vulcan Foundry, Ltd., Newton-le-Willows, Lancashire.

Contracts for the establishment of the South African Steel Corporation are to be divided into two groups, one dealing with preparation of the site for coal handling and the mining

plant, exclusive to South Africans, and the other for coke ovens and the iron and steel plant, to be open to British, Continental and American tenders.

Wagon Builders, Gloucester Railway Carriage & Wagon Co., Ltd., Hurst, Nelson & Co., Ltd., and Charles Roberts & Co., Ltd., are arranging to combine.

Belgian output in March included 334,000 metric tons of pig iron and 338,000 tons of raw steel, 10,500 tons of steel castings, 300,000 tons of finished rolled steel and 15,000 tons of finished rolled iron.

British Await Election Result

Return of Party in Power Would Assure Safeguarding Act
for Iron and Steel—Tin Plate Mills Active

LONDON, ENGLAND, May 10.—The approach of the general election has brought a tapering off in steel business, consumers being inclined to delay further buying until the results of the balloting show whether or not a safeguarding act for iron and steel is probable. From recent statements by Premier Baldwin it is clear that, should his party be returned to power,

full facilities will be given for an inquiry into the desirability of safeguarding. Should either of the opposition parties gain power, most of the existing tariffs would probably be removed.

The problem of safeguarding iron and steel is difficult of solution. If foreign competition should be shut out as completely as some producers urge,

British and Continental European prices per gross ton, except where otherwise stated, f.o.b. makers' works with American equivalent figured at \$4.85 per £ as follows:

	Durham coke, del'd.....	£0 18½s. to £0 19s.	\$4.48 to \$4.60
Bilbao Rubio ore*.....	1 3		6.18
Cleveland No. 1 foundry	3 11		17.21
Cleveland No. 3 foundry	3 10		16.97
Cleveland No. 4 foundry	3 7½		16.37
Cleveland No. 4 forge..	3 7		16.25
Cleveland basic (nom.)	3 7½		16.37
East Coast mixed.....	3 13½		17.70
East Coast hematite....	3 14		17.94
Rails, 60 lb. and up....	7 15 to 8 15		37.59 to 42.43
Billets	6 7½ to 6 10		30.91 to 31.52
Ferromanganese	13 15		66.69
Ferromanganese (export)	13 10 to 14 0		65.47 to 67.90
Sheet and tin plate bars, Welsh	6 5 to 6 7½		30.31 to 30.91
Tin plate, base box....	0 18½ to 0 18¾		4.45 to 4.53
Black sheets, Japanese specifications	13 5		64.26
		C. per Lb.	
Ship plates	7 12½ to 8 2½		1.66 to 1.76
Boiler plates	9 0 to 10 10		1.95 to 2.27
Tees	8 2½ to 8 12½		1.76 to 1.86
Channels	7 7½ to 7 17½		1.60 to 1.71
Beams	7 2½ to 7 12½		1.55 to 1.65
Round bars, ¾ to 3 in.	7 12½ to 8 2½		1.65 to 1.76
Steel hoops	9 0 to 10 0		1.95 to 2.16
Black sheets, 24 gage..	10 5 to 10 10		2.21 to 2.27
Galv. sheets, 24 gage..	13 12½ to 13 15¾		2.94 to 2.98
Cold rolled steel strip, 20 gage (nom.).....	12 0		2.64

*Ex-ship, Tees, nominal.

Continental Prices F.O.B. Antwerp or Hamburg

	Foundry iron, 2.50 to 3.00 per cent sil., 0.50 to 0.90 per cent phos.	£3 7½s. to £3 12s.	\$16.37 to \$17.45
Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	3 9		16.73
Billets, Thomas	5 3½ to 5 7		25.10 to 25.94
Sheet bars, Thomas....	5 6½ to 5 7		25.82 to 25.94
Wire rods, Low C., No. 5 B.W.G.	6 5 to 6 6¼		30.31 to 30.61
Black sheets, No. 31 gage, Japanese.....	12 12½		61.16
Rails, 60 lb. and heavier	6 10*		31.52
Rails, light	6 0		29.10
		C. per Lb.	
Steel bars, deformed...	5 17 to 5 17½		1.27 to 1.28
Beams, Thomas, British standard	5 6 to 5 7½		1.17 to 1.20
Channels, Thomas, American sections...	6 1		1.31
Angles, Thomas, 4-in. and larger, over ¾-in. thick	5 10		1.15
Angles, Thomas, 3-in..	5 14		1.23
Ship plates, open-hearth, inspected	7 10		1.62
Hoop and strip steel, over 6-in. base.....	6 7½		1.38
Wire, plain, No 8 gage	7 11½		1.67
Wire, galvanized, No. 8 gage	9 9 to 9 12½		2.05 to 2.12
Wire, barbed, 4-pt. No. 12 B.W.G.	11 19		2.58
Wire nails, base.....	7 19		\$1.72 per keg
Wire nails, assortments, 1 to 6-in. keg.....	10 9		2.26

*Open-hearth steel, 7½s. (\$1.82) per ton extra.

maintenance of export trade, which depends upon low-cost raw materials from the Continent, would be threatened. Meanwhile business has improved considerably this year without any drastic price reductions. Lower cost fuel, resulting from the cessation of demand from European consumers during the severe winter, has enabled pig iron producers to blow in more furnaces, and in the Cleveland district, alone, 41 furnaces are in blast and four more are to be put into operation soon.

Cleveland pig iron producers are heavily booked with orders, and there is no foundry or basic iron available for delivery before August. Northeast Coast producers of hematite have but little unsold tonnage for July shipment. Most of the current output of iron is being absorbed by local steel works and foundries. Foreign pig iron is not competitive, so that almost no iron is being imported, barring deliveries on a few old orders for basic.

Semi-finished material has been in active demand. Firmer Continental prices and high inland freight rates in certain districts, particularly the Midlands and Wales, have given the preference to British producers.

In finished products the mills rolling plates and large shapes are still suffering from surplus capacity. Plate

mills have been booking some substantial orders both at home and abroad, but are not yet sufficiently well engaged to maintain steady operations. New contracts for ship construction continue to be awarded and, when some of the plate tonnages are placed, operations will improve.

With output regulated on a quota basis, tin plate mills are active. Most makers are well booked ahead and in certain instances have orders for delivery in the first quarter of next year. Demand is increasing from foreign markets, and encouraging reports have been received from South America and South Africa on the tonnages to be used in fruit and vegetable packing. Under the Welsh-American tin plate agreement, the American mills must rectify certain export overshipments between now and the end of this year.

The policy of rationalization and merging in the steel industry is being pursued with the object of forming a large corporation. Companies now controlled by the Austin Friars Trust, Ltd., have a combined capital of about £8,000,000, and it is said to be the intention eventually to form a combination with a capital of about £25,000,000. The steel corporation would approach in capital stock and size the Imperial Chemical Industries.

German Business Less Active

Reparations Question and New Budget Are Factors—Coal Strike Averted—Automobile Builders Reduce Capital

BERLIN, GERMANY, May 6.—Business has been somewhat depressed by the unsettled reparations question, the budget for 1929-1930 and the sensational drain on the Reichsbank's reserves, which led to an advance of the discount rate from 6½ to 7½ per cent. Employment has improved, but this is largely because of the resumption of building construction and the seasonal requirements of agriculture. On April 15 a total of 1,480,000 persons were drawing unemployment insurance, compared with 2,460,000 in February.

The wage question in the Ruhr coal industry is expected to be settled without a strike. The arbitrator appointed has decided upon a 2 per cent increase in wages and a simultaneous reduction in the social insurance premiums paid by the miners. This represents an actual increase to all workers underground of about 5.45 per cent. The Government has declared the arbitrator's decision binding. Coal production has recently increased with total output so far this year only slightly less than for the corresponding period of 1928.

The extent to which iron and steel prices will be increased as a result of advances in miners' wages has not yet been decided. The iron and steel scrap market is quiet. Domestic demand for pig iron is small, but prices are firmer. Deliveries of rolled steel products are improving. Structural shapes are active, and there has been

some increase in domestic sales of bars and bands. The sheet market is quiet, but demand for ship plates continues to grow. The German Tube Syndicate reports April business about equal to March. Export business in pig iron is good, and semi-finished material prices are firm.

The Vulkan Shipyard at Hamburg is being scrapped as part of the policy of the holding company, the Deschimag Corporation, to reduce shipbuilding capacity. The two principal local competitors of the Vulkan company, Blohm and Voss and the Deutsche Werft A. G., were unwilling to take over the shipyard either for operation or scrapping.

Machinery and equipment manufacturers report no improvement in business. Export trade increased in April, but prices were low. Exports in blast furnace equipment and rolling mills are hampered by keen French and Belgian competition. Railroad car builders have insufficient orders to maintain even a fair rate of operation. The Railroads Corporation is planning the construction of a large union station in the center of Berlin, in connection with the recently reconstructed Stadtbahn station in the Friedrichstrasse. The new station will be the terminus of main line railroads which at present have their own terminals at the Potsdamer, Anhalt and Stettin stations.

Business in the automotive industry

is increasing, but, according to a report of the Automobile Manufacturers' Association, 68 per cent of all sales are on deferred payments. This system has not worked out with entire satisfaction, and there have been more defaults than had been expected. Financially some of the leading automobile builders are in an unsatisfactory condition. The South German Neckarsulm Co. has had to reduce its capital stock to one-fifth of its former par value, and the Adler Co. cut its capital down 50 per cent. The Nationale Daimler Corporation is expected to take similar steps.

British Merge 16 Foundries in Allied Ironfounders

LONDON, ENGLAND, May 8.—The project for combining a number of companies engaged in the light iron castings industry has reached a point where the investing public is about to be invited to subscribe some of the capital required for the purposes of the merger.

A new company with the title of Allied Ironfounders, Ltd., has been formed to effect the merger. Its authorized capital is £3,000,000 (\$14,500,000), divided equally between 7 per cent cumulative preferred and common stock. This is to be increased to £3,600,000 (\$17,500,000) by the creation of an additional 600,000 common shares.

At present Allied Ironfounders, Ltd., controls about 16 companies, but negotiations are in progress for the absorption of others. The various companies are engaged in producing cast iron products, mainly for use in the building trades. Within the past 18 months the industry has suffered a considerable decline in profits, brought about by severe domestic competition, as imports are negligible. It is the object of the merger to terminate this competition and to secure more economical distribution.

European Iron Ore Advancing

HAMBURG, GERMANY, May 8.—The Continental iron ore market is active, with prices advancing for all qualities, especially quotations on Spanish ores, which are higher than for some time. First quality Rubio ores are bringing 19s. 3d. (\$4.66) per ton, c.i.f. Rotterdam. German consumers are covering their requirements for the rest of this year, contracting for sizable tonnages of both Spanish and North African ores. The entire output of the Spanish Menera mines for the rest of this year has been sold to German consumers at 17s. 9d. (\$4.30) per ton for 50 per cent. The lower grades of iron ore have not yet advanced in price, but demand is active and the market strong. The manganese ore market continues weak, and a recent sale of 10,000 tons of 48 per cent manganese ore low in phosphorus brought only 12½d. (25c.) per unit.

American Barbed Wire Is Competitive with German

HAMBURG, GERMANY, May 8.—Wire manufacturers are showing interest in American methods of barbed wire production. It is noteworthy that the difference between prices of barbed wire and plain galvanized wire on export sales is now about 20c. per 100 lb. In Germany and other European producing countries the difference ranges from £2 10s. to £2 12s. 6d. per ton, 55c. to 57c. per 100 lb.

Because of this small difference in price between plain and galvanized wire, German mills point out that American makers can export almost as much barbed wire as the German industry, although German exports of plain wire and wire nails are eight to 10 times those of the United States. The inference is that American mills have much lower production costs in manufacturing barbed wire.

Company Pays First Dividend in Four Years

VIENNA, AUSTRIA, May 2.—After passing its dividends for four years, the Austrian Alpine Montangesellschaft has declared a dividend of 4 per cent for the business year 1928. Its capital stock is 60,000,000 sch. (\$8,460,000). For the first time since the Armistice, the coal, iron and steel producing capacity of the company was almost fully operated. Output of steel ingots and rolled products exceeded the total for 1913, and gross profits were 23,988,444 sch. (\$3,382,370), with net profits at 2,510,028 sch. (\$353,914). Business prospects for 1929 are regarded as satisfactory.

German Alloy Steel Prices Advancing

HAMBURG, GERMANY, May 8.—The German Alloy Steel Producers' Association has increased all prices 5 to 20 per cent. In some instances, quotations on ferrotungsten alloys have been advanced more than 20 per cent. Recent prices have been 4.77c. per lb. on 5 per cent nickel alloy steel, 2.90c. per lb. on 0.85 per cent chrome alloy steel, 7.25c. per lb. on tungsten-bearing alloy steel and 4.1c. per lb. on chrome-vanadium steel bars.

American Quota in Rail Cartel 18½ Per Cent

HAMBURG, GERMANY, May 8.—Although no official statement has been made by the International Rail Makers' Association (IRMA), according to reliable sources here, the total annual allotment of rails for all members is 1,050,000 tons, covering the export tonnage to all countries. This is understood to be distributed as follows: United Kingdom, 24.75 per cent; Germany, 19.875 per cent (not including deliveries on reparations); United States, 18.5 per cent; France,

17.6 per cent; Belgium, 14.325 per cent; Luxembourg, 4.955. The allotment of the Saar is included in the French quota. On the basis of these percentages, the United States has an export allotment of 194,250 tons annually.

Germany Exporting Old Files to Far East

HAMBURG, GERMANY, May 8.—In the past few years German exporters have developed a profitable business with India and the Far East in old files, which are reworked by native blacksmiths into small tools and knives. Until the German exporters entered this market, Far Eastern imports were almost exclusively from Great Britain, with an occasional small tonnage from the United States. The German prices are, as a rule, lower, although much higher than could be obtained for the files if they were sold domestically or for export as steel scrap.

Recent quotations have been £11 10s. to £12 10s. (\$55.77 to \$60.82) per ton for assortments of 50 per cent round, 25 per cent square and 25 per cent triangular, packed in 200-lb. cases. Rasps may not be included in an assortment and are always rejected by buyers in India.

New Wire Coating Process Being Tried Abroad

HAMBURG, GERMANY, May 8.—Wire manufacturers in Great Britain and Germany have been experimenting with a process for fusing a zinc alloy with steel wire, so that it is alloyed with the steel and not, as in galvanizing, merely a coating. It is claimed that wire treated by this method does not peel and can be used longer without rusting than when galvanized. The results of experiments with the process are reported satisfactory, and commercial production may be started soon.

German Steel Exporters Plan Group Buying

HAMBURG, GERMANY, May 8.—Negotiations have been instituted among the smaller exporters of iron and steel for the formation of a cooperative buying association. Mills maintain different prices, based on the quantities purchased, and in some instances the variation in price is considerable. The wire rod cartel, for instance, asks 5s. (\$1.21) per ton more for 100-ton lots of wire rods than for 1000-ton lots.

The small exporters believe that a cooperative buying office, operating with a low overhead, could combine the small tonnages purchased by the separate companies and obtain the lowest possible prices from the mills.

Hyman-Michaels Co., Chicago, has purchased the Standard Rail & Steel Co.'s plant at Madison, Ill.

More Bauxite Mined in 1928 —Imports Were Large

WASHINGTON, May 21.—The production of bauxite in the United States in 1928 was 375,426 gross tons, valued at \$2,273,898, an increase of 17 per cent in quantity over the output of 320,940 tons and of 14 per cent in valuation over \$1,988,780 in 1927, according to the Bureau of Mines. Of the 1928 production, 361,236 tons, valued at \$2,193,230, f.o.b. mines, came from Arkansas, the remainder, 14,190 tons, valued at \$80,668, coming from Georgia, Alabama and Tennessee. The 1928 production was distributed among industries as follows: Aluminum, 218,398 tons; chemical, 83,992 tons; abrasive, 72,931 tons; cement and refractory, 105 tons.

Imports in 1928 totaled 350,111 tons, valued at \$1,534,498, while exports were 112,984 tons. The producers of domestic bauxite reported sales last year at prices ranging from \$5 to \$7 per gross ton. The average for Arkansas bauxite was \$6.07; for Alabama, \$6.41; for Georgia, \$5.03, and for the United States, \$6.06.

Drop in Foundry Equipment Orders in April

The index of gross orders of the Foundry Equipment Manufacturers Association for April was 172.6, compared with 209.4 for March. The index of shipments was 220.3, compared with 197.5 in March, while unfilled orders, on April 30, were 363.4 compared with 414.4 one month previous.

Increase in Stoker Sales in April

WASHINGTON, May 21.—Mechanical stokers to the number of 141, with aggregate rating of 48,749 hp., were sold in April, against 117 with 42,432 hp. in March, according to reports received by the Department of Commerce from 10 leading manufacturers. Of the April sales, 41 stokers with 6508 hp. were installed under fire-tube boilers and 100 stokers with 42,241 hp. under water-tube boilers.

Sales during the first four months of the year were 435 stokers with 165,127 hp., against 371 with 144,683 hp. during the corresponding period of last year.

Wage Survey in Gray Iron Industry Planned

Quarterly surveys of wages in effect in every branch of the gray iron casting industry will be made by the Gray Iron Institute, Cleveland, which announces that its statistical committee has completed arrangements for making these surveys. The reports will indicate such information as the number of employees of each classification together with the average wage according to classification for the entire quarter. The information will also be tabulated by districts.

Mechanical Engineers at Rochester

(Concluded from page 1418)

of the peak loads which occur at times.

Shop layout and working conditions must be considered, in addition to the question of how often machines have to be rearranged, together with the comparative cost of shafting installation in comparison with electric wiring, before determining which class of installation is to be used.

Flywheels

In recent years the application of flywheels upon intermittent drives, such as board drop hammers and polishing stands, seems to have been forgotten, also the flywheel effect of the old cast iron pulleys in comparison with wood and pressed steel.

The author assisted in designing the shafting equipment for a large forge shop about four years ago, and used a 5000-lb. split flywheel as a receiving pulley from the motors. This has eliminated belt troubles. In fact, the majority of the original belts are still in operation on both the motors and the hammers.

Place of Schools of Non-University Type

WHAT the session devoted to education and industrial training served to emphasize was that any industrial city of size could well have its technological school of the type which aims to prepare specifically for industry as distinguished from the school which focuses on intellectual prowess and crowns its graduates with degrees. The definite niche which these institutes fill was inferentially established by the papers of the session and the more or less formal discussion which has been arranged for them. Dr. W. E. Wickenden, shortly to head the Case School of Applied Science, Cleveland, described, as director of investigation for the Society for the Promotion of Engineering Education, the technical institute as found in Europe and discussed its significance for American education. Virgil M. Palmer, superintendent of industrial economy, Eastman Kodak Co., Rochester, told of the cooperative educational experiment being carried on by the industries of Rochester. What Dr. Wickenden had to say may be summarized as follows:

The American system of technical education has developed in a very one-sided manner. It is plain that technical education has never been conceived as a national problem and thought out as a whole. The term "technical institute" is the best common designation for schools of a non-university type which work on an age level above the secondary schools. There are admirable examples in the more carefully planned European systems for which we have few counterparts. Through great diversity of name, organization, and

program runs a common warp of distinctive characteristics:

They are not trade schools nor are they preparatory schools for higher studies. Their courses are of a terminal character and are intended for young men already oriented to industry who wish intensive preparation for definite lines of advancement. Most of their students are not book-minded. Direct processes of teaching and learning are employed. Most of the student's work is done on the premises.

The entire process is pointed to the higher practical pursuits of industry rather than to its highly intellectual functions. In addition to engineering courses of a fairly general, though practical, character, these schools provide nearly all the higher training in the technology of specific industries and training for particular technical functions.

The author favors the policy of recruiting a much larger proportion of our higher technical personnel from men who already have had normal industrial experience. For that purpose, there is need of a second and more flexible ladder parallel to the university system; we may look to this agency to train men for the supervision of industrial production, installation, and operation and to train in the operative technology of specific industries.

Dr. Wickenden recommends that these schools admit students primarily on evidence of their capacity and interest rather than formal scholastic credentials, that they should shape their programs on detailed analyses of actual vocational usages, and that the teaching processes should be based on direct instruction and experience, resembling in a more organized manner the learning processes in industry.

What Mr. Palmer had to say was in part as follows:

"It is no longer necessary to offer intensive trade school training for rank and file workers. However, supervision has called for men with more and more technical knowledge. Such knowledge does not have to result from training in abstract theory, such as an engineer requires. Instead, a practical handbook type of applied technical information is sufficient.

"From an industrial viewpoint, educational requirements may be grouped into three divisions:

"1. The basic division made up of the great mass of workers, who do the every-day work of industry, work being made constantly more and more simple and routine through subdivision of effort, specialization and the application of power and automatic machinery. For this group, a common school training is ample. A grammar, or high school training suffices for social and civic needs and industrial training is secured on the job or in shop school.

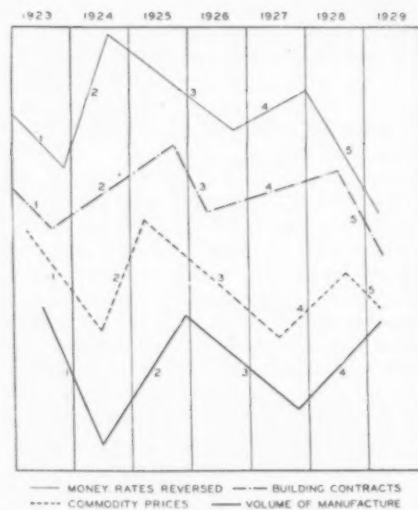
"2. The top division includes major line and staff executives. More and more those men are the product of our technical colleges and schools of business administration.

"3. There is an indeterminate division of rapidly increasing importance, to which more and more attention is being directed. This includes those in junior line and staff positions; those to whom orders are given and who transmit and follow through the carrying out of these orders. It also includes the technicians who do the technical routine work or those who assist in the control of chemical and other manufacturing processes. The Rochester Mechanics Institute is peculiarly well adapted to cooperate with industries of Rochester in developing the types of education and training required for this intermediate group."

Is a Downward Movement in Manufacture at Hand?

FIVE major movements in money rates, building contracts and average wholesale commodity prices and four major movements in the volume of manufacture have taken place since 1922, says Alvan T. Simonds, president of the Simonds Saw & Steel Co., Fitchburg, Mass., in the May issue of *Looking Ahead*.

It is not certain that the last movement is complete for money rates, building contracts or commodity prices, but "surely every reader will agree," he states, "that upward movement No. 4 of the volume of manu-



facture is not going to continue forever and that there will be a No. 5 major movement downward some time in the next two or three years."

The movements in money rates, based on data from the Federal Reserve *Bulletin*, are shown reversed because the volume of manufacture increases with falling money rates and decreases with rising money rates. The movements in building contracts are based on reports of the F. W. Dodge Corporation. The trend of commodity prices and the movements in the volume of manufacture are based on data compiled by Harvard Economic Society.

Electrochemists to Hear of Discoveries

Columbium and Tantalum Now Extracted from Ores— New Rust Proof Process for Steel

WHAT promises to be the record meeting of the American Electrochemical Society, both in attendance and in reports of new processes and products, will be held May 27 to 29, at Toronto, Canada.

Those in attendance will be the first to hear of the researches carried out at Cornell University by Prof. Wilder D. Bancroft and Newton C. Jones on the production of the rare gas, fluorine, in commercial quantities of 1,000 cu. ft. at a time. Although fluorine has been made in very minute quantities in a few laboratories in years past, and has at those times excited the interest of the investigators, it has never been possible in the past to collect sufficient quantities of this interesting, yet very elusive, gas in order to allow scientists to investigate thoroughly its characteristic properties.

Rare Metals

New results will be presented on methods for the extraction of the very rare metal, columbium, from its

sister metal, tantalum. The great difficulty of getting the metals out of their natural ores suggested the name tantalum. Both metals are of very high melting point and are unusually resistant to acids, thus opening up a wide field of application. The new investigations were carried out by Prof. L. F. Yntema of the University of Illinois. Professor Yntema will also report upon improvements in the extraction of beryllium from beryl. Beryllium, it will be recalled, is a metal exceedingly light in weight and particularly valuable to the aeronautical industry. Very small percentages of beryllium, added to aluminum and aluminum alloys, impart to these metals properties approaching those of steel.

Improvement on Galvanizing

The Grasselli Chemical Co., Cleveland, will present results on its method of protecting steel for all time from corrosion by the application of a very thin coating of the silver-white

meal, cadmium, occurring in commerce in the familiar mineral color, cadmium yellow. The process of cadmium-coating steel has been introduced in various plants and has met with much favor.

A total of almost 50 technical and scientific papers will be presented at the Toronto meeting. The main scientific session will be devoted to the "Electromagnetic Characteristics of Electrochemical Processes." The president of the society is Paul J. Kruesi of Chattanooga, Tenn., the son of John Kruesi, a former associate of Thomas A. Edison at Menlo Park.

The last day of the meeting, May 30, will be devoted to an inspection of the new copper and nickel plant of the International Nickel Co., at Port Colborne, Ontario.

Regional Meeting of Power Transmission Association

The Power Transmission Association will have a dinner meeting at 7 p.m. June 7 at the Boston Chamber of Commerce. This will be the first Boston regional meeting of the organization. The purpose of the conference is to outline the possibilities of mechanical power transmission equipment and the recent and proposed activities of the association. In addition to addresses, there will be motion pictures and open discussion.

Thresh Out Open-Hearth Problems

(Concluded from page 1421)

considerable discussion, for a number of the men present had tried ineffectually to tap slag from their furnaces. One man reported using \$10 worth of oxygen for this purpose and getting "only a hatful of slag".

On the German furnace a gain of 30 per cent in output is claimed. All the brick used in the regenerators are silica with the exception of the straight 9-in., which are of fire clay. The charge is 40 per cent pig iron and 60 per cent scrap. Fluidity of the slag is attributed to a "balance in basicity". The refractories are said to stand up well under the working conditions; waste gases enter the first fore-chamber at 1300 deg. C. (2372 deg. Fahr.). It is claimed that the checkers made in this manner are good for 30 years.

Stool Wash for Best Results

NO wash whatever was reported by a number of operators. Stool stickers do not seem to be much of a problem in these cases. One man said that his practice is to open the nozzle easily, to avoid cutting the stool. His ingots are mostly 22 x 24 in., with some 18 x 38-in. slab ingots, and his stool practice is about 6 lb. to the ton of ingots. Another man reported 4.3 lb. to the ton, with some stickers.

Some clay wash was mentioned, but without commendation. Graphite

wash sprayed on the molds was reported as running down on to the stools. Graphite was reported in use on the stools in one plant, when special steels are made, with clay for the common run of product. Lime as a wash was cited, in conjunction with a practice of 4 lb. of stools to the ton of steel.

One man who uses tar, brushed on, said he had quite a few stickers. This brought up the assertion, from another source, that the use of tar is likely to result in vertical cracks, particularly near the corners of the ingots. Cracks $\frac{1}{4}$ in. deep and as much as 2 ft. long were mentioned, with the steel, to a depth of $\frac{1}{4}$ in. around the cracks, analyzing all the way from 0.08 to 0.29 per cent carbon. The idea was advanced that this segregation of carbon results from the steel picking up carbon from the tar at points where the tar is unevenly spread. The cracks were attributed to uneven contraction, caused by this great variation in carbon content. The use of tar was abandoned three years ago, and the cracks ceased.

Aluminum paint, mixed with water and sprayed on, was discussed by two men. One reported good results, particularly on low-carbon killed steel. The other man uses this on high-nickel steels, and says it "looks good".

(To be concluded next week)

Steel Treating Membership at New High

On April 30 the total membership of the American Society for Steel Treating was 5,484, according to an announcement of Secretary William H. Eisenman. During April there were 144 new members registered and 121 reinstated. This gain of 265 was offset by 92 members dropped for non-payment of dues and 13 by resignation and death, a net gain of 160. The total membership is the highest which the society has ever been able to report. There are also two chapters which now, for the first time, have a membership exceeding 500, those at Chicago and Detroit.

Thermal Conductivities of Copper and Nickel

"Thermal Conductivities of Copper and Nickel and Some Alloys of Nickel" is the title of Bulletin No. 21 in the engineering and science series of the Rensselaer Polytechnic Institute, Troy, N. Y. The authors are W. C. Ellis, F. L. Morgan and G. F. Sager. They pronounce the method evolved by King as satisfactory for the determination of the properties of metals and alloys in the form of wire. They have investigated the ratio of thermal and electrical conductivity and have found it to be somewhat higher for the alloys than for the elementary metals; the values are, however, of the same order of magnitude.

Machinery Markets and News of the Works

Sales Volume is Still High

May Orders Will Fall Little, If Any, Below Those of April
—Price Advances Under Consideration

SALES of machine tools during the past week have held at a volume about equal to that of the first 10 days of the month. It is expected that May totals will fall little, if any, below those of April. Some builders report that sales are somewhat larger than those for the same number of days last month. There has been a lack of large orders, but this has been more than offset by the liberal number of small sales to almost all classes of buyers.

The agricultural implement trade is a prospective source of considerable business. Some of the companies in

this line in the Chicago district are preparing large lists of their requirements.

A new tool and die shop to be built in Chicago has placed orders for about \$80,000 worth of tools.

If machine tool buying should decline, as it usually does with the approach of summer, it is certain that the decline will be gradual. In any event, most of the shops have sufficient orders on hand to carry on at their present operating rates well through the summer.

The price situation is strong, and there is a likelihood of some advances.

New York

NEW YORK, May 21.—A moderate decline in the volume of machine tool buying in this district is indicated by reports from local selling offices. Orders the past week have been lighter than those of recent weeks, and the total for May, according to present totals, will be smaller than that of April, which was a big month in this territory. Although machine tool sales for the country as a whole were slightly lower in April than in March, April was the better month for most of the sales offices in New York. The Ingersoll-Rand Co. is in the market for a number of tools for its plant at Phillipsburg, N. J.

Ford Motor Co. has purchased a site on Hudson River at Edgewater, N. J., for an assembling plant, which will be used largely for export business, to cost over \$3,500,000 with equipment.

Contract has been let by Victor Metal Products Corporation, 196 Diamond Street, Brooklyn, to William P. McGarry, 292 Freeman Street, for rebuilding three-story plant recently destroyed by fire, to cost about \$45,000 with equipment. Albert C. Kunzi, 781 Manhattan Avenue, is architect.

Metropolitan Distributors, Inc., 627 West Forty-ninth Street, New York, has arranged with Max N. Natanson, 522 Fifth Avenue, for construction of six-story automobile service, repair and garage building to occupy block front on Tenth Avenue, from Thirty-eighth to Thirty-ninth Street, to cost about \$1,000,000 with equipment.

International Projector Corporation, 90 Gold Street, New York, manufacturer of motion picture machines and parts, has acquired six-story factory adjoining present plant for expansion. Four additional stories will be built on purchased building, developing total floor space of 150,000 sq. ft. Project will represent investment of more than \$400,000.

National Casket Co., 470 Jackson Avenue, Long Island City, has plans for five-story addition, 60 x 230 ft., to cost about \$180,000 with equipment. Stein & Vitolo, 56 West Forty-fifth Street, New York, are architects.

National Container Corporation has been formed with capital of 140,000 shares of stock, no par value, to take over and expand company of same name with plant at Long Island City, manufacturer of corrugated boxes and containers. Company represents a merger of Columbia Corrugated Co., William Herman & Co., Inc., New York Corrugated Co., and International Corrugated Co., all of Brooklyn and New York.

Pilot Radio & Tube Corporation, Brooklyn, has been organized to take over and expand plant and business of Pilot Electric Mfg. Co., 323 Berry Street, manufacturer of radio equipment and parts. New company is arranging for sale of stock issue of about 100,000 shares, part of fund to be used for purpose noted.

Merritt, Chapman & Scott, Inc., 135 Edgewater Street, St. George, S. I., operating a dredging business, has plans for one-story machine shop and wood-working plant, to cost about \$75,000 with equipment. Baker & Spencer, 17 Battery Place, New York, are architects.

In connection with expansion program

of Harbor Marine Steel Corporation, recently organized to take over R. G. Harry, Inc., 136 Liberty Street, New York, manufacturer of iron and steel products, and other interests, announced in these columns last week, plans are under way for installation of new steel galvanizing plant at works of Key City Bolt & Spike Works, Hudson Boulevard, Bayonne, N. J., one of units in consolidation; other iron and steel working facilities will be provided. New company has arranged for sale of 49,000 shares of common stock, part of fund to be used for purpose noted. R. G. Harry is president.

Royal Show Case Co., 648 Wythe Avenue, Brooklyn, N. Y., has plans for one and one-half story unit, 45 x 100 ft., to cost about \$50,000 with equipment. Murray Klein, 65 Court Street, is architect.

Beaver Mfg. Co., 625 North Third Street, Newark, manufacturer of electric wiring equipment and devices, has awarded general contract to Doe Wathey Co., 178 Abington Avenue, for two-story and basement addition, to cost about \$45,000 with equipment. Marshall N. Shoemaker, 15 Central Avenue, is architect.

Schicklerling Radio Tube Corporation, Newark, recently organized, will take over and succeed to local plant and business of Conrad Schicklerling, Inc., 401 Mulberry Street, manufacturer of radio tubes and equipment. New company plans expansion and installation of additional equipment. To provide for this and other development, it is arranging for sale of 100,000 shares of stock. Conrad Schicklerling is head.

Star Electric Motor Co., 134 Miller Street, Newark, manufacturer of motors, dynamos and kindred electrical equipment, has acquired 3½-acre tract on Riverside Avenue, for two-story plant totaling about 80,000 sq. ft. floor space, to cost about \$150,000 with equipment.

New Brunswick General Sheet Metal Works, Inc., 152 Neilson Street, New Brunswick, N. J., has plans for one and two-story addition, 35 x 100 ft., to cost over \$25,000 with equipment. Alexander Merchant, 1 Elm Row, is architect.

Eisler Electric Corporation, Newark, has been formed to take over and expand plant and business of Eisler Engineering Co., Inc., 760 South Thirteenth Street, manufacturer of radio equipment and parts. Company has arranged for stock issue to total \$1,732,000, part of proceeds to be used for expansion.

Raritan Copper Works, Inc., foot of Elm Street, Perth Amboy, N. J., plans erection of three one-story units, to cost about \$60,000 with equipment.

Simmen Hydraulic Jack Corporation, First National Bank Building, Perth Amboy, N. J., has been incorporated with capital of \$125,000 to manufacture hydraulic jacks and other hydraulic hoisting apparatus. Company has not definitely decided whether it will manufacture or assemble this equipment.

Kaiser Control Corporation, 101 Park Avenue, New York, has been incorporated with capital of \$10,000 to manufacture

electric control equipment. Company has not decided whether it will do its own manufacturing or have it done on contract.

Automatic Heat & Service Co., 371 Broadway, Long Branch, N. J., is in market for two carloads a month of steel tanks of 275, 500 and 1000-gal. capacity. A. J. Hoffman is president.

Ross Appliances, Inc., 116 Nassau Street, New York, has been incorporated to manufacture metal bed pans. Work will be done on contract. H. M. Ross is president.

Duke Steel Co., dealer in tool steels, has moved from 191 Pearl Street, New York, to 99 Beekman Street. B. Fortuyn heads company.

Columbia Tool Steel Co., 87 Poinier Street, Newark, will open a warehouse with a full line of tool steels, servicing New Jersey, New York, Delaware, Maryland and Pennsylvania east of Altoona. W. W. Phillips is district sales manager.

New England

BOSTON, May 20.—Business with machine tool dealers is spotty, but in the aggregate better than a week ago. Houses having machines that can be delivered within eight weeks do not lack customers. Sales reported the past week included open-side planers, special pin grinding equipment, lathes, grinding machines, presses, punches and shears. The used tool market is rather flat, partly due to scarcity of equipment. More activity is anticipated, however, owing to purchases by dealers of equipment, sold at public auction, of Newton Pressed Steel & Mfg. Co., Newton, Mass., William H. Wilkinson Co., West Medway, Mass., and Peter L. Thompson Co., Boston.

New England machine tool manufacturers report business in April below the March total, although maintaining an excellent aggregate. While the month showed comparatively few large orders, it was again featured by an abundance of single unit orders for both large and small tools. March and April both showed a slight decline, although this is taken to indicate a more natural level for the industry. Prospective transactions, however, give promise of a continued healthy volume.

Pumps and miscellaneous equipment are required by Bristol County Agricultural School, Dighton, Mass., for its water supply system.

Norlander Machine Co., 463 South First Street, New Bedford, Mass., will build a one-story machine shop, 36 x 50 ft.

Hodgman Rubber Co., Herbert Street, Framingham, Mass., has plans for a one-story manufacturing plant, 60 x 90 ft. Miscellaneous equipment is required.

Fairhaven Iron Foundry New Bedford, Mass., has plans for a foundry to replace one recently destroyed by fire. New equipment will be purchased.

George H. Sweetman, 643 Atlantic Avenue, Boston, has awarded a contract for a one-story paper manufacturing plant, 50 x 150 ft., at Cambridge, Mass. Motors and other equipment will be purchased.

A. C. Gilbert Co., 493 Blatchley Avenue, New Haven, Conn., toys and electrical goods, will soon start erection of a one-story addition.

United Aircraft & Transport Co., East Hartford, Conn., will spend about

The Crane Market

INQUIRY for both overhead and locomotive cranes continues active, but awards are not numerous. An outstanding locomotive crane inquiry is a list of eight 25-ton, gasoline or diesel motor driven, standard gage cranes for the Baltimore & Ohio Railroad, Baltimore. In the New York district the Carlson Hoist & Machine Co., Brooklyn, is inquiring for a small crane.

Among recent purchases are:

New York, New Haven & Hartford Railroad, New Haven, Conn., large capacity gantry crane from unnamed builder.

Boston Electric Railroad, Boston, small capacity electric traveling crane from unnamed builder.

Century Coal Co., Ltd., Toronto, 25-ton American Hoist & Derrick Co. locomotive crane from A. R. Gellinas, Montreal.

Milnes Coal Co., Ltd., Toronto, 25-ton American Hoist & Derrick Co. locomotive crane from A. R. Gellinas.

Inland Steel Co., Chicago, 175-ton ladle crane from Alliance Machine Co. and three 15-ton, 100-ft. span and one 20-ton, 100-ft. span overhead cranes from Wisconsin builder.

\$1,300,000 on its proposed plant, not including the cost of proving ground and hangars.

Thompson Products, Inc., Hartford, Conn., has a contract from a large airplane engine manufacturer, to furnish engine valves for the remainder of this year. New metal-working equipment is under consideration.

Contract has been let by L. F. Dettenborn Woodworking Co., Taylor Street, Hartford, Conn., to Southern New England Contracting Co., 68 Temple Street, for four-story addition, 40 x 200 ft., to cost over \$85,000 with equipment.

C. & M. Metal Products Corporation, Pittsfield, Mass., has arranged for space in Potter Building, Main Street, and for production of dies, metal stampings and kindred products.

Provincetown Light & Power Co., Provincetown, Mass., has approved plans for new steam-operated electric power plant, to cost more than \$100,000 with equipment.

Officials of Bendix Aviation Corporation, South Bend, Ind., have organized a subsidiary, Bendix-Cowdrey Brake Tester, Inc., to take over plant and business of Cowdrey Brake Tester Organization, Inc., Fitchburg, Mass. New company plans increased production.

Hollingsworth & Vose Co., 333 Washington Street, Boston, has plans for addition to paper mill at East Walpole, Mass., one story, 35 x 225 ft., to be used in part for extensions in machine department, to cost over \$125,000 with equipment.

Viking Seaboat Corporation, New Haven, Conn., recently organized by Reginald D. Thomas and associates, has leased part of local plant of Winchester Repeating Arms Co., totaling 20,000 sq. ft. floor space, for manufacture of airplanes of amphibian type, to include parts production and assembling departments. Mr. Thomas will be in charge of production.

Pratt & Whitney Aircraft Co., Capitol Avenue, Hartford, Conn., manufacturer of aircraft motors and parts, has engaged Albert Kahn, Inc., Marquette Building,

Detroit, architect and engineer, to prepare plans for new plant on 600-acre tract at East Hartford, recently acquired. Initial unit will be of continuous one-story type, totaling about 500,000 sq. ft. floor space, and will be given over to production of Wasp and Hornet engines, as well as Vought-Corsair airplanes. It will cost more than \$3,500,000 with equipment. Company has awarded contract to R. G. Bent Co., 93 Edwards Street, for addition to present plant for engine-testing. Organization is a subsidiary of United Aircraft & Transport Corporation, New York; Frederick B. Rentschler is president.

Philadelphia

PHILADELPHIA, May 20.—Bids will soon be asked by Gulf Refining Co., Sydenham Avenue and Locust Street, Philadelphia, for five one- and two-story buildings at Girard Point, to cost \$330,000 with equipment. Edward B. Lee, Seventh Avenue and Smithfield Street, Pittsburgh, is architect; headquarters of company are in Frick Annex, Pittsburgh.

American Fabricated Steel Co., 2442 Bodine Street, Philadelphia, has awarded general contract to James Seallon, 423 Diamond Street, for one-story addition for storage and distribution.

Janney Cylinder Co., 7425 State Road, Philadelphia, manufacturer of engine cylinders and kindred mechanical products, has plans for one-story machine shop addition, to cost about \$23,000 with equipment.

Vacuum Oil Co., 61 Broadway, New York, has acquired four-acre tract at Fifty-seventh Street and Eastwick Avenue, Philadelphia, for new storage and distributing plant, to cost over \$200,000 with equipment.

Raymond A. White, Jr., 1010 City Line, Philadelphia, and associates have organized Lebanon Boiler Works, with capital of \$75,000, and plan operation of plant in this section for manufacture of boilers, tanks and other steel plate products. John Y. Mace, 103 South Fourth Street, Colwyn, Pa., is interested in new company.

Board of Education, 9 South Stockton Street, Trenton, N. J., will install machine shop, automobile repair shop, tool works, cabinet shop and other units in new two- and three-story high school on Chambers Street, to cost \$2,225,000, for which bids will be received on general contract until June 5. Ernest Sibley, Palisade, N. J., is architect.

Trenton Potteries Co., North Clinton and Ott Streets, Trenton, N. J., manufacturer of sanitary ware and fixtures, has awarded general contract to Karno-Smith Construction Co., Broad Street Bank Building, for five-story addition, 63 x 275 ft., with two one-story units, 64 x 170 ft., and 46 x 170 ft., to cost about \$500,000 with machinery. Lockwood Greene Engineers, Inc., 1 Pershing Square, New York, is architect and engineer.

International Harvester Co., 606 South Michigan Avenue, Chicago, will build one-story addition to factory branch and distributing plant at Harrisburg, Pa., to cost about \$35,000.

Board of Trustees, Odd Fellows' Home of Pennsylvania, Middletown, has plans for construction of power plant at institution, to cost about \$100,000 with equipment. William H. Lee, 1505 Race Street, Philadelphia, is architect.

Hazlebrook Coal Co., Mount Carmel, Pa., will begin construction of new electrically-operated coal breaker, 110 ft. square and 120 ft. high, at Mid Valley

colliery, near Raven Run, to cost more than \$750,000 with machinery.

Hamilton-Sagamo Corporation, Lancaster, Pa., has been organized to take over and consolidate Hamilton Watch Co., with local plant, and Sagamo Electric Co., Springfield, Ill., manufacturer of electric clocks, electric meters, radio parts, etc. It is proposed to remove Springfield plant to Lancaster, where expansion will be carried out and production concentrated.

Carolina Sheet Metal Corporation, 3009 Chestnut Street, Philadelphia, has been incorporated to take over Carolina Sheet Metal Works, Inc., which has been operating in Philadelphia since 1927. Company is engaged in fabrication of sheet metal for heating, ventilating and cooling systems. W. R. Eichberg is president.

South Atlantic

BALTIMORE, May 10.—Bids will be asked at once by Maryland Meter Works, Inc., 301 East Saratoga Street, Baltimore, for extensions and improvements in seven-story factory, to cost \$55,000. Theodore W. Pietsch, American Bank Building, is architect.

Cumberland Airport Co., Perrin Building, Cumberland, Md., has plans for airport, including hangar, 70 x 100 ft., with shop and reconditioning facilities, to cost over \$50,000 with equipment. Airport Development & Construction Co., Mitten Building, Philadelphia, is engineer.

Western Electric Co., 195 Broadway, New York, has filed plans for 14 one- and multi-story buildings on 160-acre tract at Baltimore for new plant to manufacture cable, telephone apparatus and radio equipment, to cost \$24,000,000 with machinery. Work on initial units will begin at once. H. K. Ferguson Co., Cleveland, is engineer and contractor.

Enterprise Wire & Iron Works, Inc., 423 North High Street, Baltimore, has plans for one-story addition, 35 x 90 ft., to cost about \$35,000 with equipment.

Chief of Engineers, United States Army, Washington, has authorized purchase of one gasoline-operated combination clamshell and dragline excavator crane, for use at San Francisco, and bids will be asked soon.

Goodyear Tire & Rubber Co., Akron, Ohio, has purchased mill of American Textile Co., Atco, near Cartersville, Ga., and will remodel for early occupancy. General expansion will be carried out to cost over \$800,000 with machinery.

Nachman Spring-Filled Corporation, Norfolk, Va., L. Burnstein, president, has leased building on Granby Street, and will establish plant to manufacture spring units for automobile cushions, furniture service, etc. Later company proposes to build new plant to cost more than \$200,000.

Fair Association, Milledgeville, Ga., has purchased 30-acre tract and plans establishment of municipal airport, including hangars, repair and reconditioning shops, and other units, to cost more than \$40,000.

Rustless Iron Corporation of America, Inc., Loney's Lane, Baltimore, plans one-story addition for production of special alloy metals, rust-resisting alloys, etc., to cost about \$30,000 with equipment. A. H. Wild is president.

Board of Directors, Boys' Training School, Rocky Mount, N. C., has plans for four two-story units to cost about \$90,000. G. R. Berryman, Odd Fellows Building, Raleigh, N. C., is architect.

General Fire Extinguisher Co., 24 North Highland Avenue, Atlanta, Ga.,

with headquarters at Providence, R. I., has awarded general contract to Brazell & Miller, Norris Building, for new local factory branch and distributing plant, to cost \$80,000 with equipment. Lockwood Greene Engineers, Inc., Wilson Building, Charlotte, N. C., is engineer.

Clinch River Coal Co., Bristol, Va., Louis B. Sless, president, is planning development of local tract and will install mining plant, engine and boiler plant and other units. Equipment will be purchased soon including mining cars, cable, tools, etc., also pumping machinery.

Pittsburgh

PITTSBURGH, May 20.—Machine tool trade the past week showed a rather general improvement. With the exception of a large order for rolling mill equipment, placed by a Southern company with Pittsburgh interests, no outstanding business has been closed, but individual orders totaled a fair volume. The Chesapeake & Ohio Railroad has placed some additional tools for its Huntington shops and purchases have also been made by the Westinghouse Electric & Mfg. Co. Subsidiary companies of the Steel Corporation are inquiring for tools and cranes, and a \$1,000,000 development has been announced at the Mercer works of American Sheet & Tin Plate Co., Sharon, Pa. Steel company activity is also well distributed in nearby districts, particularly at Youngstown and Wheeling, W. Va.

Washington Mould, Machine & Foundry Co., Washington, Pa., has awarded general contract to Hutter Construction Co., Fond du Lac, Wis., for one, two and three-story addition, 112 x 176 ft., to cost about \$100,000 with equipment. F. Kubitz, Publication Building, Pittsburgh, is architect.

Copperweld Steel Co., Glassport, Pa., manufacturer of copper-covered steel products, is disposing of preferred stock issue of \$1,500,000, part of fund to be used for expansion.

American Window Glass Co., Farmers' Bank Building, Pittsburgh, is said to be planning extensions in plant at Hartford City, Ind., including installation of new sheet glass drawing machines and auxiliary equipment. Company will also make improvements at sheet glass plant at Belle Vernon, Pa.

Nicholson & Co., Inc., Pittsburgh, has been organized with capital of \$100,000 to take over and expand company of same name, with plant at Rankin, specializing in production of chains, forgings, and kindred iron and steel products. New company is headed by David K. and Toland Nicholson, 218 North Dallas Avenue, Pittsburgh.

General Motors Corporation, Detroit, has purchased 40 per cent interest in Fokker Aircraft Corporation of America, Inc., Glendale, W. Va., and will be active in management. Plants at Glendale and Teterboro, N. J., will be continued and increased output arranged. Company also proposes to build new parts and assembling works near San Francisco, to cost over \$100,000. Purchasing company has transferred holdings in Dayton-Wright Co., Dayton, Ohio, including McCook air field, to Fokker organization, which contemplates development at that place. Anthony H. G. Fokker, chief engineer and official of Fokker company, will continue with organization.

K. Simon Wagon Works, 160 Fullerton Street, Pittsburgh, has asked bids on general contract for two-story addition to wagon and automobile body plant, to cost \$40,000 with equipment. A. R. Douglass, Benedum Trees Building, is architect and engineer.

Indiana

INDIANAPOLIS, May 20.—Contract has been let by Dudlo Mfg. Co., Fort Wayne, manufacturer of wire, electric coils, etc., a division of General Cable Corporation, New York, to Indiana Engineering & Construction Co., Central Building, for one-story addition, 165 x 210 ft., to cost about \$100,000 with equipment. C. R. McAnlis, Central Building, is architect.

City Council, Indianapolis, has engaged William C. McGuire of McGuire & Shook, 941 North Meridian Street, architects, to prepare plans for buildings for municipal airport near Ben Davis, where 1000-acre tract has been secured. Work will comprise two hangars, repair shops, oil storage and other buildings, to cost more than \$100,000 with equipment. Paul H. Moore, aeronautical secretary, Indianapolis Chamber of Commerce, is manager of airport.

Automotive Gear Works, Richmond, has asked bids on general contract for new plant consisting of two units, one story, 60 x 125 ft., and two stories, 40 x 60 ft., to cost about \$75,000 with equipment. Pierre & Wright, Hume-Mansur Building, Indianapolis, are architects.

Board of Directors, Indiana State Normal School, Muncie, is taking bids on general contract for an addition to vocational training building, to cost \$60,000 with equipment. Snyder & Babbitt, Hayden Building, Columbus, Ohio, are architects.

Hayes Body Corporation, Indianapolis, is planning expansion at local plant, used primarily for body manufacture for Marmon automobiles, to increase capacity from 275 to 450 bodies per day. Headquarters are at Grand Rapids, Mich.

Buffalo

BUFFALO, May 20.—Multi-cell Radiator Corporation, 80 Terrace Street, Buffalo, recently organized by Arthur B. and Charles A. Harrison, has awarded general contract to L. A. Harding Construction Corporation, 1335 Main Street, for new plant at Lockport, N. Y., one-story, 100 x 200 ft., to cost about \$60,000 with equipment. Production will be given over to copper radiators and other heating equipment.

Oneida Community, Ltd., Oneida, N. Y., manufacturer of silver-plated and metal-plated ware, animal traps, etc., has purchased properties of William A. Rogers, Ltd., manufacturer of kindred products, including plants at Niagara Falls, N. Y., Northampton, Mass., and Wallingford and Hartford, Conn. New owner will continue all present plants and plans expansion. Pierpont D. Noyes is president of purchasing company.

Roessler & Hasslacher Chemical Co., Twenty-sixth Street and Buffalo Avenue, Niagara Falls, N. Y., manufacturer of industrial chemicals, has awarded general contract to Wright & Kremers, Inc., Pine Avenue and Main Street, for one-story addition for storage and distribution, to cost \$50,000 with equipment.

Pierce, Butler & Pierce Mfg. Corporation, Syracuse, N. Y., manufacturer of heating equipment, boilers, etc., is ar-

ranging for note issue to total \$1,200,000, part of proceeds to be used for expansion.

Nineteen Hundred Corporation, Binghamton, N. Y., has been formed with capital of 489,105 shares of stock, no par value to take over and consolidate 1900 Washer Co., also known as Binghamton Washing Machine Corporation, with local plant, and Upton Machine Co., St. Joseph, Mich., manufacturer of kindred equipment. New company plans expansion. Present plants will be continued.

Curtis Aeroplane & Motor Co., 74 Kail Street, Buffalo, is arranging for a production schedule of four to five complete aircraft motors a day, of 175 to 600 hp. capacity, at its new plant in Tonawanda Township, covering 50-acre tract, now nearing completion. Kail Street plant will be used largely in future for production of complete commercial and military airplanes, with increased assembling capacity through additional floor space, heretofore given over to motor manufacture. New plant will have total floor space of 450,000 sq. ft. C. Roy Keys is vice-president and general manager.

Detroit

DETROIT, May 20.—Contract has been let by Detroit Gasket & Mfg. Co., 6209 Hamilton Street, Detroit, to Kreighoff Co., local, for one-story addition, to cost over \$45,000 with equipment. Christian W. Brandt, Kresge Building, is architect and engineer.

Decker Screw Products Co., Albion, Mich., has awarded general contract to Schumaker Construction Co., Albion, for one-story addition, 60 x 195 ft., to cost about \$50,000 with equipment.

Carew-Leidjen Co., Muskegon, Mich., recently organized to manufacture electric signs and displays, has leased a building at Muskegon Heights and will remodel for new plant. F. J. Carew and M. C. Leidjen are heads.

Howell Electric Motors Co., Howell, Mich., has plans for an addition, to cost over \$50,000 with equipment.

Sparta Foundry Co., Sparta, Mich., has purchased local plant and business of Oil Piston Ring Co., manufacturer of piston rings for engines for automobiles, tractors and airplanes. Purchasing company will consolidate with organization and operate as a subsidiary. Sparta company is arranging for sale of 22,500 shares of common stock, part of fund to be used for expansion.

American Enameled Wire Co., Muskegon, Mich., is planning expansion program to cost about \$100,000, including installation of additional equipment. Company is a subsidiary of Electric Auto-Lite Co., Toledo, Ohio.

Clayton-Lambert Co., French Road, Detroit, manufacturer of brass products, has filed plans for one-story addition, 100 x 100 ft., to cost over \$70,000 with equipment.

Wilcox-Rich Corporation, Saginaw, Mich., has authorized expansion and improvements in airplane engine valve division. An addition will be built soon to cost about \$150,000 with equipment, and other units will be constructed later.

Board of Education, 1354 Broadway, Detroit, has authorized plans for new power house at Roosevelt School, Linwood Avenue, to cost about \$90,000 with machinery. Malcolmson & Higginbotham, 1219 Griswold Street, are architects; Mc-

Coll, Snyder & McLean, Penobscot Building, are mechanical engineers.

Detroit Edison Co., 2000 Second Avenue, Detroit, is planning new equipment storage and distributing plant, to cost about \$85,000 with mechanical handling and other facilities.

Swiss Boring, Inc., 12875 Coyle Avenue, Detroit, has been incorporated to engage in boring holes in gages, tools, dies, jigs, etc. Company will lease a factory. H. S. Hanson is president.

Cincinnati

CINCINNATI, May 20.—Machine tool bookings have been of substantial volume, and indications are that May will show little, if any, decline from April. In fact, several large builders report that sales this month are running somewhat ahead of those in April. There has been a dearth of sizable individual orders, but this has been more than offset by the liberal number of small sales to almost all classes of buyers. Considerable railroad business is pending, but little has been closed the past week. Production in local shops continues at capacity with some departments working overtime.

Formica Insulation Co., 4614 Spring Grove Avenue, Cincinnati, has awarded general contract to Ferro Concrete Construction Co., local, for an addition to contain 25,000 sq. ft. of manufacturing area. Cost is estimated at \$50,000.

Stuebing-Cowan Co., 312 East Court Street, Cincinnati, manufacturer of electric lift trucks, has plans for one-story plant with 65,000 sq. ft. of floor space, to cost \$200,000.

Contract has been let by Carlton Machine Tool Co., Spring Grove and Meeker Streets, Cincinnati, to Austin Co., for one-story addition, 112 x 150 ft., to cost about \$100,000 with equipment.

Plans are under way for merger of Showell Corporation, Columbus, Ohio, manufacturer of show cases, etc., and Bryan Show Case Co., Bryan, Ohio. It is proposed to concentrate operations at Columbus and build an addition.

Cincinnati Sheet Metal & Roofing Co., 26 East Front Street, Cincinnati, has work under way on extensions to cost about \$70,000 with equipment. Howard McClorey, Bank of Commerce Building, is architect.

American Air Filter Co., Louisville, has been organized to take over and consolidate Reed Air Filter Co., with local plant at 215-25 Central Avenue, and National Air Filter Co., 5130 Ravenswood Avenue, Chicago. It is proposed to concentrate production at Louisville and expansion program to cost about \$85,000 will be arranged. W. M. Reed is president of consolidated organization, and H. C. Murphy, vice-president.

Board of Education, Eighth and Chestnut Streets, Louisville, will receive bids until May 28 for manual training equipment for local schools; also electrical supplies, sheet metal supplies, hardware, etc., as per specifications at office of Samuel D. Jones, business director.

Board of Education, Portsmouth, Ohio, plans installation of manual training equipment in new junior high school to cost about \$250,000, for which plans will be drawn by William B. Ittner, 96 Locust Street, St. Louis, architect.

Rendigs, Panzer & Martin, Southern Ohio Bank Building, Cincinnati, archi-

tecs, have awarded general contract to Roos-Meyer-Hecht Co., 2824 Stanton Avenue, for three-story automobile service, repair and garage building, to cost about \$300,000 with equipment.

Tennessee Central Service Co., Nashville, recently formed as a subsidiary of Cities Service Co., 60 Wall Street, New York, is concluding negotiations for purchase of group of electric light and power properties in Tennessee and North Carolina, including Bristol Gas & Electric Co., Elk Park Light & Power Co., and Newland Light & Power Co., and will consolidate. Expansion will be carried out, including transmission line construction. Company has asked permission to issue bonds for \$6,000,000, portion of fund to be used for expansion noted.

Fulton Syphon Co., Knoxville, Tenn., manufacturer of heat regulating apparatus, etc., has awarded general contract to J. M. Dunn & Co., 245 Broad Street, for plant extensions and improvements, to cost about \$20,000 with equipment.

Cleveland

CLEVELAND, May 20.—Machine tool business held up in good volume the past week. While there were not many orders for more than single machines, small orders were plentiful and well distributed. Inquiry continues good.

Great Lakes Aircraft Corporation, Cleveland, has awarded a contract to Austin Co. for an extension to provide 10,000 sq. ft. of additional manufacturing space. When completed this will enable company to begin straight line production methods in building planes. It is planning a daily output of 10 planes.

Bids will be asked at once by Cleveland Universal Jig Co., 2005 Rockwell Avenue, Cleveland, for one and two-story plant, to cost about \$45,000 with equipment.

Hillwood Mfg. Co., 21700 St. Clair Avenue, Cleveland, manufacturer of cut nails, tacks, etc., has awarded general contract to Walter Frantz, 3914 Forestwood Avenue, for one-story addition, 35 x 150 ft., and 50 x 100 ft., to cost about \$60,000 with equipment.

Youngstown Steel Door Co., Cleveland, has acquired 15-acre tract at Youngstown for new plant to cost about \$700,000 with equipment. Present works and executive offices at Cleveland will be removed to new location. Company is closely affiliated with interests connected with Youngstown Sheet & Tube Co., Youngstown.

Osgood Co., Marion, Ohio, manufacturer of steam shovels, mining dredges, etc., has awarded general contract to Bellefontaine Bridge & Steel Co., Bellefontaine, Ohio, for one-story addition to gray iron foundry, to cost more than \$40,000 with equipment.

Mather Spring Co., Toledo, Ohio, manufacturer of steel springs, bumpers and other automobile equipment, is said to have plans for one-story plant unit, primarily for production of steel bumpers, to cost over \$750,000 with machinery. Willys-Overland Co. contemplates purchase of present plant property of Mather company, which adjoins its automobile works, and will use for expansion.

Gravity Carburetor Co., 3062 East Third Street, Cleveland, is having plans drawn for a one-story addition, 40 x 100 ft., to cost about \$45,000 with equipment.

Board of Education, Toledo, is said to be planning installation of manual training department in three-story junior high school, for which bids will be received on June 1, to cost \$550,000. Edward M. Gee is architect for board.

Chicago

CHICAGO, May 20.—Sales of machine tools have held steady at about the rate of the previous week, and if new business in sight is a true indicator, purchases within the next few weeks will be well maintained. The agricultural implement trade, which for some time has found need only for miscellaneous machine tools, is preparing a number of good sized lists. Expansion of jobbing shops is worthy of note. A new tool and die shop, soon to be erected in Chicago, was the source this week of orders aggregating \$80,000.

Railroad buying is sluggish. The Santa Fe still has some items to be placed and bids are being submitted against the Union Pacific list. The situation in the used tool market is acute. Prices are high and the available supply is shrinking. Prices for machine tools are firm and reports indicate that advances are being considered by some manufacturers.

Details of merger of Moline Implement Co., Moline, Ill., Minneapolis Steel & Machinery Co. and Minneapolis Threshing Machine Co. have been made public by Robert W. Lea, president of Moline company, and new organization will be known as Minneapolis-Moline Power Implement Co. There will be issued \$1,500,000 in common stock and 100,000 shares of preferred stock.

Willis Motors Corporation has plans for a \$1,200,000 three-unit plant on a 174 acre site at Bensenville, Ill. This corporation, organized a little more than a year ago to manufacture gasoline motors, is now located in Maywood, Ill.

Universal Stamping & Mfg. Co., Chicago, has awarded a general contract to Chicago Industrial Construction Co. for a building, 108 x 170-ft., to cost \$60,000.

Chicago Steel & Wire Co., 10257 Torrence Avenue, Chicago, will erect a one-story addition, 25 x 102-ft. to cost \$10,000. H. Walker, 6411 South Park Avenue, Chicago, is contractor.

Contract has been let by Rockford Iron Works, 648 Race Street, Rockford, Ill., to Holm-Page Co., 2117 Kishwaukee Street, for one-story foundry addition, to cost about \$24,000 with equipment.

Runzel-Lenz Electrical Mfg. Co., 1751 North Western Avenue, Chicago, is planning to rebuild part of plant recently destroyed by fire, with loss reported over \$200,000 including equipment.

Unity Mfg. Co., 1217 South Michigan Avenue, Chicago, has leased about 25,000 sq. ft. floor area at 2901 Indiana Avenue, for expansion.

Proviso Township High School Board of Education, 124 South Seventeenth Street, Maywood, Ill., is planning installation of manual training equipment in addition to high school to cost \$1,000,000, for which plans will be drawn by J. C. Llewellyn, 38 South Dearborn Street, Chicago, architect.

Standard Oil Co., Whiting, Ind., has plans for new oil storage and distributing plant at Tilton, Ill., including boiler house and automobile service, repair and

garage building, to cost \$140,000 with equipment.

Francis & Nygren Foundry Co., 2514 Fillmore Street, Chicago, has awarded general contract to Strobel & Hall, 192 North Clark Street, for one-story addition, to cost about \$55,000 with equipment.

Englewood Desk Co., 5820 Lowe Avenue, Chicago, plans rebuilding part of plant destroyed by fire May 10.

Globe Machinery & Supply Co., 205-11 Court Avenue, Des Moines, Iowa, has awarded general contract to Arthur H. Neumann & Co., Hubbell Building, for one-story and basement addition, 130 x 132 ft., to cost \$45,000 with equipment.

Iowa-Nebraska Light & Power Co., Fourteenth and O Streets, Omaha, Neb., is considering extensions and improvements in electric light and power plant at Shenandoah, Iowa, to cost over \$100,000.

McQuay Radiator Corporation, 1600 Broadway, N. E., Minneapolis, will soon proceed with superstructure for two-story addition to cost \$45,000 with equipment, for which general contract recently was let to Ernest M. Ganley Co., 2922 Oakland Avenue, Perry E. Crosier, New York Life Building, is architect.

Wyckoff Drawn Steel Co., 3200 South Kedzie Avenue, Chicago, has awarded general contract to Webster Construction Co., 605 North Michigan Avenue, for one-story storage and distributing plant, 50 x 312 ft., to cost about \$40,000 with equipment. W. M. Wood, 208 South La Salle Street, is architect.

City Council, Benson, Minn., is planning extensions and improvements in municipal electric light and power plant, including installation of additional equipment. Druar & Milinowski, Globe Building, St. Paul, Minn., are engineers.

St. Louis

ST. LOUIS, May 20.—Bids have been asked by Multiplex Display Fixture Co., 918 North Tenth Street, St. Louis, manufacturer of store and display equipment, for two-story addition, 60 x 105 ft., to cost about \$40,000 with equipment. C. G. Schoelch & Co., Syndicate Trust Building, are architects.

A. C. Goebel Aviation Co., Inc., Hotel Muehlebach, Kansas City, Mo., plans one-story shop for repair and reconditioning service for airplanes and motors in connection with aviation school near municipal airport, to cost over \$75,000 with equipment. Alonzo H. Gentry, March Building, is architect.

Reid-Ward Motor Co., 2500 McGee Street Trafficway, Kansas City, Mo., local representative for Packard automobile, has plans for four-story service, repair and sales building, to cost \$375,000 with equipment. Packard Motor Car Co., Detroit, is interested in project.

City Council, Monroe City, Mo., is planning extensions and improvements in municipal electric light and power plant, including installation of additional equipment, to cost \$30,000. W. B. Rollins & Co., Railway Exchange Building, Kansas City, Mo., are engineers.

Plans have been arranged for a merger of Mahoney-Ryan Aircraft Corporation, St. Louis, and Aircraft Development Corporation, Detroit. It is proposed to continue plant at first-noted place and carry out expansion program.

R. A. Rearwin, 310 South Eighth Street, Salina, Kan., and associates have plans for a one-story aircraft manufacturing

plant, 100 x 300 ft., in Fairfax Industrial district, Kansas City, Mo., including parts production and assembling departments, to cost about \$70,000 with equipment. I. L. Zerbe, 139 Santa Fe Street, Salina, is architect.

Oklahoma Oil & Royalty Co., Oklahoma City, Okla., is planning construction of pipe line for natural gas service from Terral, Okla., to Ringgold, Tex., and vicinity, to cost over \$250,000 with booster stations.

J. A. Harrington, Huntsville, Ark., and associates are planning construction of an electric light and power plant for local service, to cost more than \$40,000 with equipment. An ice-manufacturing plant is also proposed.

Refinery Supply Co., 228 East Fourth Street, Tulsa, Okla., manufacturer of oil-well equipment and supplies, plans one-story shop addition, to cost about \$25,000 with equipment.

Board of Education, North Platte, Neb., is considering installation of manual training equipment in new high school to cost about \$400,000, for which plans will be drawn by Meginnis & Schaunberg, Federal Trust Building, Lincoln, Neb., architects.

Garland-Clevinger School of Aeronautics, Philtower Building, Tulsa, Okla., has acquired 100-acre tract near city, for aviation school and airport. Plans are under way for hangars, repair and reconditioning shops, administration building and other units, to cost over \$200,000 with equipment. R. F. Garland is head.

Milwaukee

MILWAUKEE, May 20.—Replacementments appear to be the major requirements in machine-tool trade. A healthy volume of business is being closed, and no complaint is heard in respect to demand. Production is the principal problem, and while some plants are making headway toward balancing shipments with delivery specifications, others are as far behind on orders as at any time this year. Sources of new business still cover a broad field of industries.

Bucyrus-Erie Co., South Milwaukee, manufacturer of locomotive cranes, excavating machinery, etc., has placed general contract with Worden-Allen Co., for a machine and erecting shop extension, 85 x 180 ft.; a locomotive round-house, 61 x 140 ft., and a smaller structure, 20 x 45 ft.

S. A. Perkins, Waukesha, Wis., has contracted with C. A. Dailey & Son, local, for a manufacturing building, 175 x 300 ft., with a second-story office portion, for a company manufacturing automotive parts in another Wisconsin city which he is reorganizing and transferring to Waukesha. Identity of company is not revealed. Mr. Perkins is secretary and treasurer of the Waukesha Motor Co. Investment in new plant will be about \$100,000.

Belle City Malleable Iron Co., Racine, Wis., is erecting a two-story foundry addition, 60 x 80 ft., designed by A. A. Wickland & Co., consulting engineers, Chicago.

Wisconsin-Michigan Power Co., 112 East College Avenue, Appleton, Wis., is starting work on a machine and forge shop addition to its local power plant, costing about \$25,000.

Franks Tool Co., Franksville, Wis., has placed contracts for a factory addition, 60 x 150 ft.

Wisconsin Power & Light Co., Madison, Wis., has accepted bid of John Schneiberg, 945 Bluff Street, Beloit, Wis., for a three-story addition, 42 x 65 ft., to its steam generating plant at Beloit.

Liberty Foundry Co., Inc., 6600 State Street, Wauwatosa, suburb of Milwaukee, has broken ground for a one-story addition, 80 x 102 ft., 16 ft. high, for finishing castings. William F. Tubising, local, is general contractor.

Widmeyer Spring Co., 426 Michigan Street, Milwaukee, manufacturer of automobile replacement springs, has leased one-story building, 50 x 100 ft., and will remodel at a cost of about \$25,000.

Merrill Mfg. Co., Merrill, Wis., formerly Merrill Machinery & Supply Co., is remodeling building formerly used as a machine and forge shop into a plating department, with equipment for both nickel and cadmium plating. Company's principal products are now wire goods and stampings, although a department is maintained for machinery repairs and replacements.

Isle LaPlume Boat & Pattern Works, LaCrosse, Wis., will build a one-story addition, 38 x 120 ft.

Henry A. Nelson, commissioner of public works, Racine, Wis., is taking bids until May 27 for building and equipping a municipal garbage incinerator with three 40-ton units, building to be sufficient for two additional units.

City of Sheboygan, Wis., will be ready about Aug. 1 to call for bids for construction and equipment of a municipal filtration plant costing \$375,000 being designed jointly by Pearce, Greeley & Hansen, 6 North Michigan Avenue, Chicago, and Jerry Donohue Engineering Co., Sheboygan. C. U. Boley is city engineer.

Gulf States

BIRMINGHAM, May 20.—Bids will be received by Board of Aldermen, Houma, La., until June 12 for one full Diesel type engine, electric generator and auxiliary equipment for municipal electric light and power station; specifications on file at office of city clerk.

Arkansas Natural Gas Co., Monroe, La., operated by Cities Service Co., 60 Wall Street, New York, is planning construction of pipe line from Monroe field to Shreveport, La., and vicinity, about 100 miles. Line will be 20 in. in diameter, and is reported to cost more than \$750,000 with booster stations and auxiliary equipment.

Tidal Refining Co., Houston, Tex., operated by Tide Water Oil Co., 11 Broadway, New York, has plans for oil refinery on Houston ship channel to handle 15,000 bbl. of crude oil per day, to cost more than \$2,500,000 with machinery. C. R. Barton is president.

General Motors Corporation, Detroit, has asked bids on general contract for one- and two-story service and parts plant, 120 x 160 ft., at Jacksonville, Fla., to cost about \$125,000 with equipment. It is understood that unit will be used primarily for Chevrolet automobiles.

Tips Engine Works-Heierman Industries, Inc., 300 Crockett Street, Austin, Tex., manufacturer of engines, parts and other equipment, is planning a one-story unit, largely for steel fabricating, to cost about \$35,000.

City Council, Greenwood, Miss., is planning to rebuild part of municipal electric light and power plant recently destroyed by fire. Roy Stott is general manager of station.

Texas Air Transport, Inc., Fort Worth

Bank Building, Fort Worth, Tex., is planning local airport, including hangars, repair and reconditioning shops, oil storage and other units, to cost more than \$75,000 with equipment. Company has approved erection of similar plant at Big Spring, Tex., to cost about \$60,000. A. P. Barrett is president.

Texas Outdoor Advertising Co., 806 Houston Street, San Antonio, Tex., has purchased property for new sign manufacturing plant, for which plans will soon be drawn, to cost about \$35,000 with equipment.

Houston Lighting & Power Co., Houston, Tex., has arranged for a bond issue of \$2,000,000, part of proceeds to be used for extensions and improvements in plants and system.

Gulf Pipe Line Co., Houston, Tex., a subsidiary of Gulf Oil Co., Frick Annex, Pittsburgh, has authorized construction of new pipe line from Refugio oil field to Corpus Christi, Tex., and vicinity, about 32 miles. Company will also build new oil storage and distributing plant on property of Eggleston Oil Co., Corpus Christi. Deep water terminals will be built for handling output. Entire project will cost more than \$500,000. Company is also planning construction of 30-mile pipe line from Crane-Midland property, near Midland, Tex., to connect with present system.

E. L. Conger, mayor, Vaiden, Miss., will receive bids until June 3 for equipment for municipal waterworks, including two motor-driven pumping units and accessories; steel tank of 100,000 gal. capacity, on 108-ft. steel tower; steel reservoir of 60,000 gal., and other equipment. Culley-O'Brien Engineering Co., Inc., Lampton Building, Jackson, Miss., is engineer.

Connors Steel Co., Empire Building, Birmingham, has taken out permit for one-story addition, 72 x 260 ft., to cost over \$60,000 with equipment.

Pecos Valley Gas Co., Carlsbad, N. M., is disposing of bond issue of \$475,000, part of fund to be used for expansion in natural gas properties and pipe lines.

Texas City Terminal Co., Texas City, Tex., is considering construction of additional storage and distributing units at local grain elevator, to cost about \$250,000 with machinery. Work is in progress on extensions and improvements in elevator to increase delivery capacity from 10,000 to 40,000 bu. per hr.

Pacific Coast

SAN FRANCISCO, May 16.—Contract has been let by Pacific Malleable Castings Co., Eighty-fifth Street and Railroad Avenue, Oakland, Cal., to Meyer Brothers, 727 Portola Street, San Francisco, for one-story machine shop, to cost about \$25,000 with equipment.

Port Stockton Cement Co., care of W. C. Stevenson, 15 Serritos Street, San Francisco, engineer, recently organized, has plans for a new plant near Sonora, Cal., where limestone properties have been acquired. Initial work will include a stone quarry to cost over \$600,000 with machinery. Following, a cement mill will be built, including power house, machine shop, pumping station and auxiliary buildings, to cost about \$2,000,000 with equipment. Company has applied for permission to dispose of 1,000,000 shares of stock, part of fund to be used for project. Mr. Stevenson was formerly connected with Pacific Portland Cement Co., as chief engineer, and will be prominently identified with Port Stockton organization.

Municipal Power Bureau, South Broadway, Los Angeles, is arranging for ex-

penditure of \$17,500,000 for extensions and improvements in municipal power properties, including construction of about 200 miles steel tower transmission lines, six new power substations, and distributing facilities. Special election has been called on June 4 to approve bond issue in amount noted.

Western Air Express, Los Angeles, care of A. M. Edelman and A. C. Zimmerman, H. W. Hellman Building, architects, has plans for new airport near Alhambra, consisting of hangar, 96 x 390 ft., repair shop, oil storage and other buildings, to cost over \$100,000 with equipment.

Ford Motor Co., Detroit, has awarded general contract to Clinton Construction Co., Stock Exchange Building, Los Angeles, for new assembling plant at Long Beach, Cal., to cost about \$2,000,000 with machinery. B. R. Brown is chief engineer of construction department of Ford company, in charge.

Peerless Lighting Co., 1124 Folsom Street, San Francisco, manufacturer of lighting fixtures and equipment, plans rebuilding part of plant destroyed by fire May 8.

Douglas M. Longyear, Hollywood, Los Angeles, local representative for Packard automobile, has awarded general contract to P. J. Walker Co., W. M. Garland Building, Los Angeles, for two-story service, repair and sales building, 100 x 200 ft., to cost about \$100,000 with equipment.

General Petroleum Corporation, San Francisco, is planning extensions and improvements in oil storage and distributing plant at Linnton, Ore., to cost \$150,000 with equipment.

Canada

TORONTO, May 20.—James Morrison Brass Co., 93 Adelaide Street, West, Toronto, will start work immediately on erection of a four-story addition, to cost \$160,000.

It is reported that Skinner Co., Ltd., Gananoque, Ont., will establish a plant at Oshawa, Ont., to manufacture automobile bumpers, etc. Company has purchased 8-acre site for erection of a plant, 100 x 400 ft.

Black Granite Co., Lake St. John, is contemplating building a plant at Roberval, Que., to cost \$30,000.

Northern Electric Co., 121 Shearer Street, Montreal, has awarded general contract to Foundation Co. of Canada, Ltd., 746 Sherbrooke Street, West, for two plant additions, four and eight stories, respectively.

Canadian Pacific Railway Co., head office, Montreal, has awarded contract to Anglin-Norcross, Ltd., Temple Building, Toronto, for extensions at Toronto to cost \$800,000. Buildings will include round house and turn-table, water tank, ash handling plant, etc. Colonel Ripley, New Union Station, Toronto, is general manager of central region.

A number of contracts have been awarded for a plant at Windsor, Ont., for Swedish Crucible Steel Co., 1165 McDougall Street, to cost \$75,000. F. N. Frier, Murphy Building, Detroit, is architect.

Chapleau Electric Light & Power Co., Chapleau, Ont., has contracted with Dominion Construction Co., Ltd., Montreal, and H. G. Acres & Co., Ltd., Niagara Falls, for erection of a hydroelectric power plant to cost \$100,000. Construction will start immediately on a dam and

a power house in which two units of 275 hp. each will be installed.

Western Canada

City Council, Weyburn, Sask., has approved plans for expenditure of \$65,000 on additions to power plant. Purchase of a 750-kw. unit is considered.

City Council, Winnipeg, has awarded contract to Boland Brothers, Ltd., 4 Bannatyne Avenue, East, for erection of a blacksmith shop, carpenter shop, paint shop, etc.

Provincial Department of Public Works, Edmonton, Alberta, has awarded general contract to Foote & Allyn, 841 Tegler Building, for repair and work shops to cost \$23,000.

Foreign

ARRANGEMENTS are being completed by Shell Petroleum Corporation, London, England, with interests in United States, including Petroleum Conversion Corporation, 136 Liberty Street, New York, under cooperative agreement, for construction of gasoline refineries, to operate under a special oil cracking process of last-noted company. Initial plant will be built at Wood River, Ill., and will cost over \$5,000,000 with machinery; a second plant will be erected at Wilmington, Los Angeles, to cost close to like sum. Other refineries will be constructed at different foreign oil centers, each to cost from \$2,500,000 to \$5,000,000. Fred B. Lloyd, president, Petroleum Conversion Corporation, is one of active officials.

Civic Commissioners, Sydney, Australia, have authorized an additional fund of about \$5,000,000 for expansion of Bunnerong power plant, now in course of construction as a municipal enterprise to furnish light and power throughout metropolitan district. Up to present time about twice the sum noted has been expended. New work will include extensions, machinery installations and transmission line construction.

Soviet Russian Government, Moscow, has engaged Albert Kahn, Marquette Building, Detroit, architect and engineer, to prepare plans and supervise construction of a new plant at Stalingrad, at mouth of Volga River, southern Russia, for manufacture of motor tractors for farm and other service. Works will include one-story assembling works, 350 x 1400 ft.; foundry, 400 x 500 ft.; forge shop, 200 x 300 ft.; machine shops, administration building, etc., to cost about \$1,000,000 with equipment. It is estimated that project will require about 18 months for completion. It is expected to be followed by a project for automobile manufacturing plant, as well as cotton mills, and for which plans will be drawn by same architect. A large part of equipment for tractor plant will be purchased in United States through Amtorg Trading Corporation, 261 Fifth Avenue, New York.

Ford Motor Co., Detroit, has plans for construction of new automobile assembling plant at Dagenham, Essex, England, where site has been secured on Thames River, to cost over \$3,500,000 with machinery.

Metal Grilling.—Diamond Mfg. Co., Wyoming, Pa. Folder of four pages illustrating and describing some of the numerous types of grilles produced for radiator covers and other covering members for architectural purposes.

Lubrication.—Morgan Engineering Co., Alliance, Ohio. Instructions for lubrication are covered in a 20-page pamphlet devoted primarily to care of overhead cranes of various types, charging machines, rolling mills, punches and shears, steam hammers and high-speed forging presses. Specific lubricants, both oil and grease, are recommended for specific purposes in each of these several types of service.

Flood Lighting.—General Electric Co., Schenectady, N. Y. Bulletin GEA-161D of 20 pages illustrates and describes a line of flood lighting projectors of the Novalux type. Many of the illustrations show installations. Tabular matter includes information covering power and general utility values.

Container Car Service.—Pennsylvania Railroad, Broad Street Station, Philadelphia. Pamphlet of 14 pages illustrating and describing container car equipment and service, whereby rail and trucking facilities may be coordinated in handling less-than-carload freight shipments. Illustrations show clearances and methods of placing the containers in position.

Pyrometers.—Roller-Smith Co., 233 Broadway, New York. Supplement No. 1 to Bulletin No. 400, in four pages, illustrated, describes Type FD (4-in.) pyrometers made by this company.

Molding Machines.—Tabor Mfg. Co., Philadelphia. Bulletins 291, 292, 293 and 294 describe respectively flask lift (stripping plate) machines, power and jar squeezers, plain and shockless jarring machines and rollover pattern-drawing machines. These are all illustrated, giving many details of parts so that repairs may be ordered. Instructions designed to promote best use of the machines are included. The various types shown are of several sizes.

Fireproof Building Construction.—Leslie G. Berry, structural engineer, Charlotte, N. C. Illustrated description in 32 pages of a combination of steel columns with concrete floors. Flexibility of the method is claimed. Illustrations are numerous, including line drawings showing connections and method of operation.

Recuperative Soaking Pits.—Chapman-Stein Co., Mount Vernon, Ohio. Four-page folder illustrating several recent soaking pits installed by the company. These are of the recuperative type, and large capacity for a given area is claimed.

Canvas Cushion Tire.—Divine Brothers Co., Utica, N. Y. Catalog 22 of 30 pages illustrates and describes canvas cushion caster and truck wheels as fitted to casters and wheels for industrial work. They are said to be suited for any truck, any floor and any service and, it is said, will not grind or mar the floors over which they are operated. The catalog gives many illustrations of different types.

Tempering Baths.—General Electric Co., Schenectady, N. Y. The four-page bulletin, GEA-801A, superseding GEA-801, describes electrically heated tempering baths which are compact, self-contained devices for tempering steels at temperatures up to 800 deg. Fahr. It is illustrated.

New Trade Publications

Heating Galvanizing Tanks.—General Electric Co., Schenectady, N. Y. Bulletin GEA-1102 of 4 pages illustrates and describes electric heating equipment for tanks used in hot galvanizing. Close control of temperature is a feature for which a number of important claims are made.

Increasing Life of Cold Header Dies.—Uddeholm Co. of America, Inc., New York. Pamphlet describing inspection of high carbon steels. Recommends open spray quench from below for header dies, with water of standard temperature, and 5-hr. tempering heat.

Alloy Steel Castings.—Sivyer Steel Casting Co., Milwaukee. A four-page leaflet, illustrated, giving in detail the physical properties and heat treatment of six special steels produced by the company, including vanadium, chrome-nickel, manganese-carbon, chrome and special molybdenum steels.

Copper-Bearing Steel Pipe.—National Tube Co., Pittsburgh. Bulletin 11. Quotes results of investigations, showing durability of commercial steels and irons when exposed to atmospheric corrosion.

Pyrometers.—Bristol Co., Waterbury, Conn. A three-page folder describes the uniform production secured in a gas-fired Japan oven as a result of the use of Bristol temperature controlling instruments. Illustrations of the application to the ovens are included.

Carburizing Boxes.—Driver-Harris Co., Harrison, N. J. A one-page leaflet describes carburizing containers made of sheets of nichrome which are recommended as economical. These boxes are welded and it is stated that, during a service of three years, not one of over 1000 containers ever failed at the weld.

Lifters and Stackers.—Lewis-Shepard Co., Watertown, Mass. Folder of 16 pages illustrating and describing a line of elevating and stacking hoists. There are many views showing applications in industrial work.

Lift Truck.—Barrett-Cravens Co., 1302 West Monroe Street, Chicago. Bulletin 120 of eight pages illustrates and describes the Red-Head lift truck, operated by hand, and designed for handling skid loads in industrial and loading work.

Variable-Speed Transmission.—Reeves Pulley Co., Columbus, Ind. Folder devoted to adjustable speeds and the method of obtaining them, as worked out by the Reeves engineers.

Steel Tanks.—William B. Scaife & Sons Co., Oakmont, Pittsburgh. Folder of four pages featuring a tank or cylinder with a seam filled with molten copper, making it practically invisible.

Gas Burners.—Lee B. Mettler Co., 406 South Main Street, Los Angeles. Catalog of 20 pages illustrating and describing entrained combustion gas burners, which may be used in conjunction with pulverized fuel or oil furnaces.

Manganese Steel Parts.—Southern Manganese Steel Co., 6600 Ridge Avenue, St. Louis. Pamphlet of eight pages illustrating and describing excavating dipper teeth, conveyor equipment, caterpillar treads, crushers, etc., in which manganese steel, Fahlroloy and other special products have been used.

Coating Tanks.—H. O. Swoboda, Inc., 3400 Forbes Street, Pittsburgh. Bulletin 160 of 12 pages illustrates and describes Falcon electrically heated asphaltum coating tanks.

